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Congenital Atresia of Esophagus

October 1953

SIXTY-SECOND YEAR OF PUBLICATION

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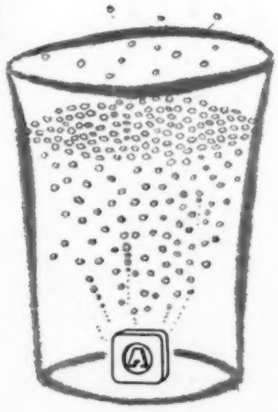

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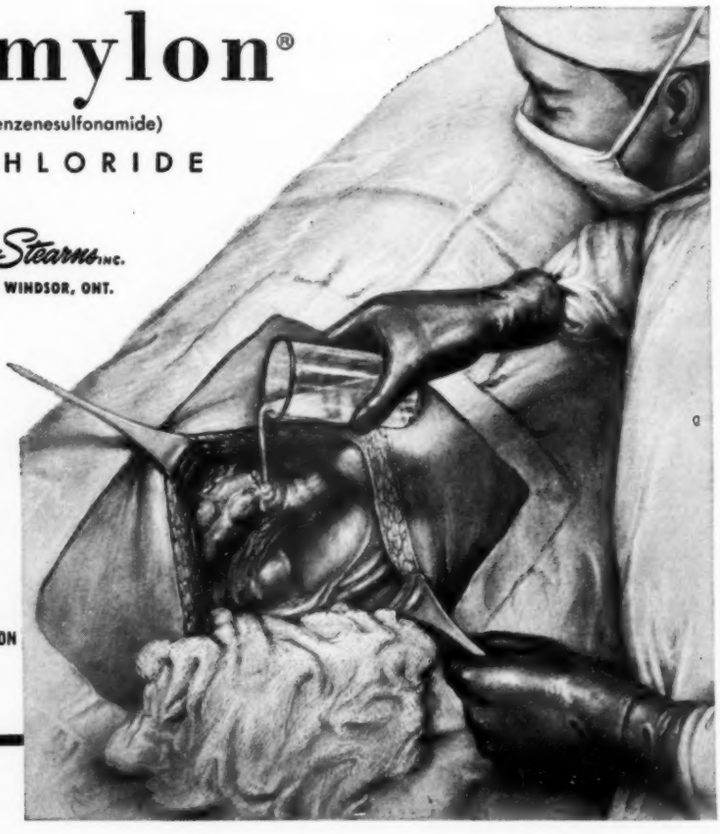

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The American Journal of Surgery

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TREATMENT OF CANCER OF THE FLOOR OF MOUTH AND TONGUE . . . . . *Simon Krantz, Lieut. Edgar D. Grady and James B. Holloway* 387

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CONTROL OF PAIN FROM RECTAL CARCINOMA WITHOUT SEDATION . *Laurence G. Bodkin* 395

On the assumption that overstimulation of the parasympathetic nervous system was a factor in producing pruritus ani, parasympathetic stimulants were given in thirty-seven cases of carcinoma of the rectum, and absence of pain was noticed in twenty-one cases.

CONTROL OF DELTOID BURSITIS WITH THE KNOTT TECHNIC OF BLOOD IRRADIATION THERAPY *G. P. Miley and A. A. Laplume* 401

A report of the results obtained in twenty-two consecutive cases of deltoid bursitis in which the Knott technic of blood irradiation was employed.

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Various factors during pregnancy (intestinal displacement, atony, inactivity) make it virtually impossible for most women to go through the gestation period without constipation.

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1. Greenhill, J. P.: Principles and Practice of Obstetrics, ed. 10, Philadelphia, W. B. Saunders Company, 1951, pp. 103-104; 311; 332.

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The American Journal of Surgery

Reg. U. S. Pat. Off., Nov. 3, 1936

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CHOLECYSTECTOMY AND SPHINCTEROTOMY FOR BILIARY DYSKINESIA. A CLINICAL ATTEMPT TO DEFINE THE INDICATIONS . . . . . *Hyman Sneierson* 429

The author presents a résumé of the present status and use of section of the sphincter of Oddi. A technic for doing the procedure is outlined. Five illustrative cases diagnosed biliary dyskinesia and one diagnosed chronic recurrent pancreatitis are reported, with discussion.

Modern Operative Technics

CONGENITAL ATRESIA OF THE ESOPHAGUS WITH TRACHEO-ESOPHAGEAL FISTULA. A SIMPLIFIED METHOD OF RESTORING CONTINUITY OF THE ESOPHAGUS . . . . . *Jacob K. Berman and Edward J. Berman* 436

The authors review some of the important diagnostic criteria of congenital atresia of the esophagus. A simplified technic of establishing continuity between the upper and lower segments is outlined.

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Review

HIGHLIGHTS IN THE TREATMENT OF VARICOSE VEINS AND ULCERS . . *John E. Summers* 443

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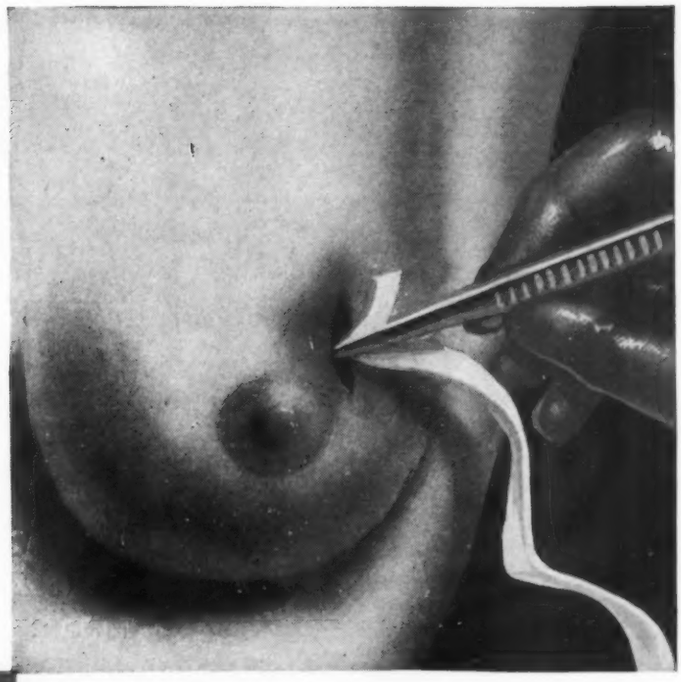
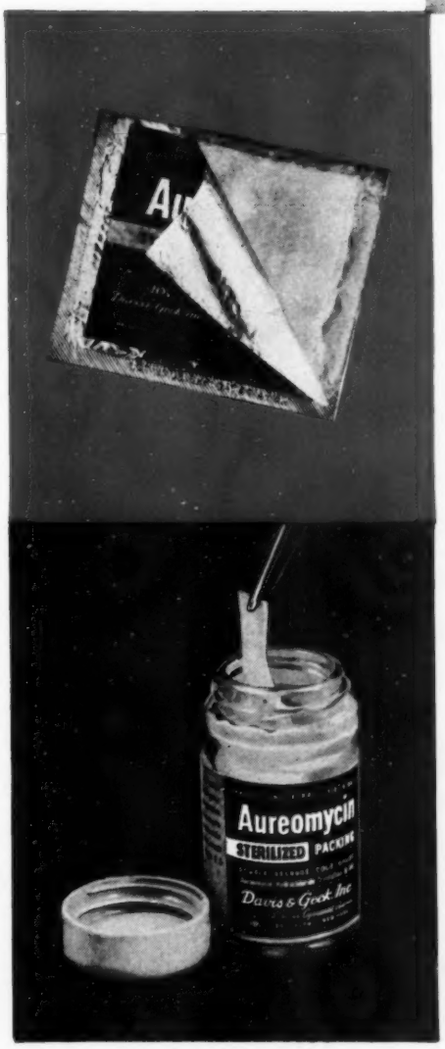
1. Marchisello, P. J., Prigot, Aaron, and Wright, L. T.: Am. Jour. Surg., Dec., 1952.





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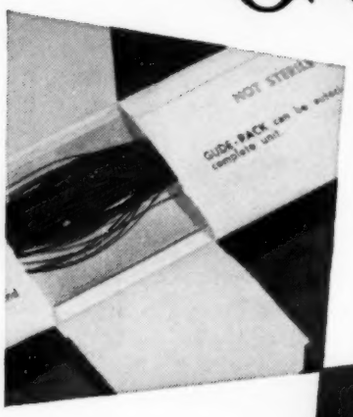

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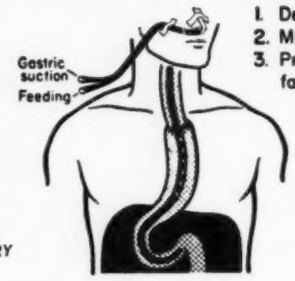

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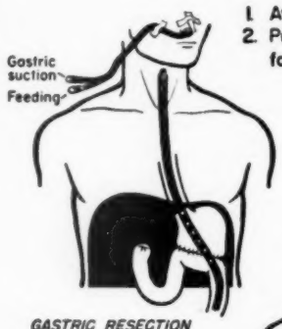

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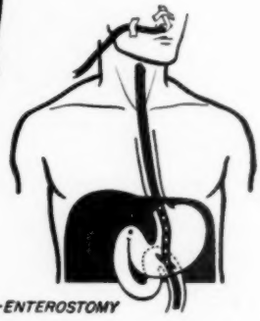

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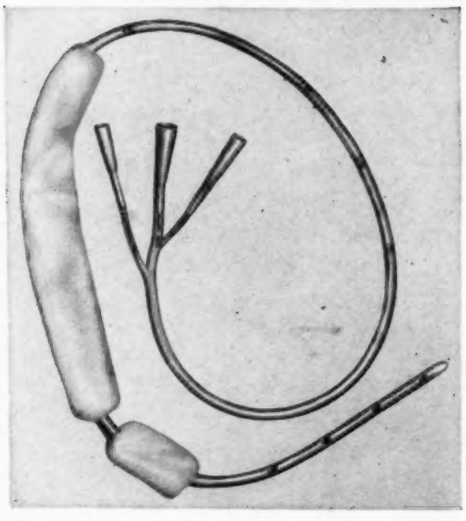

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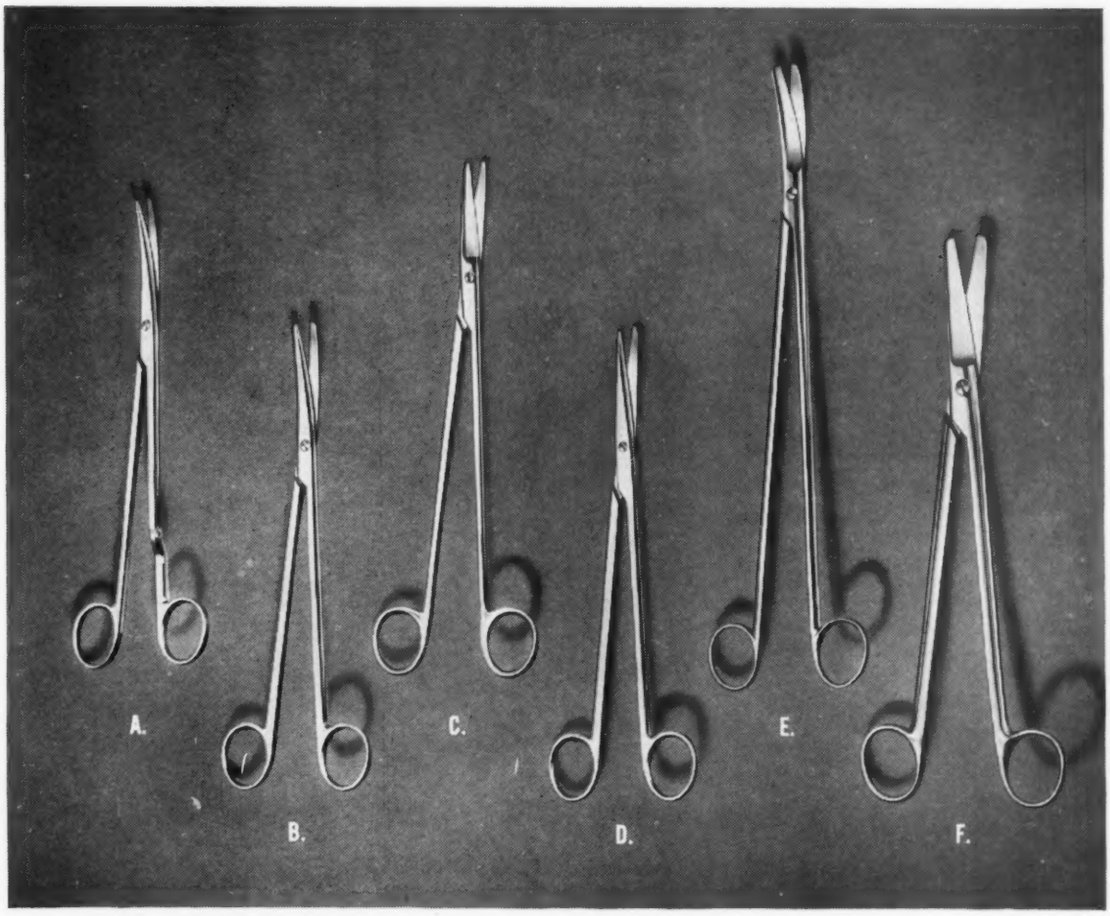

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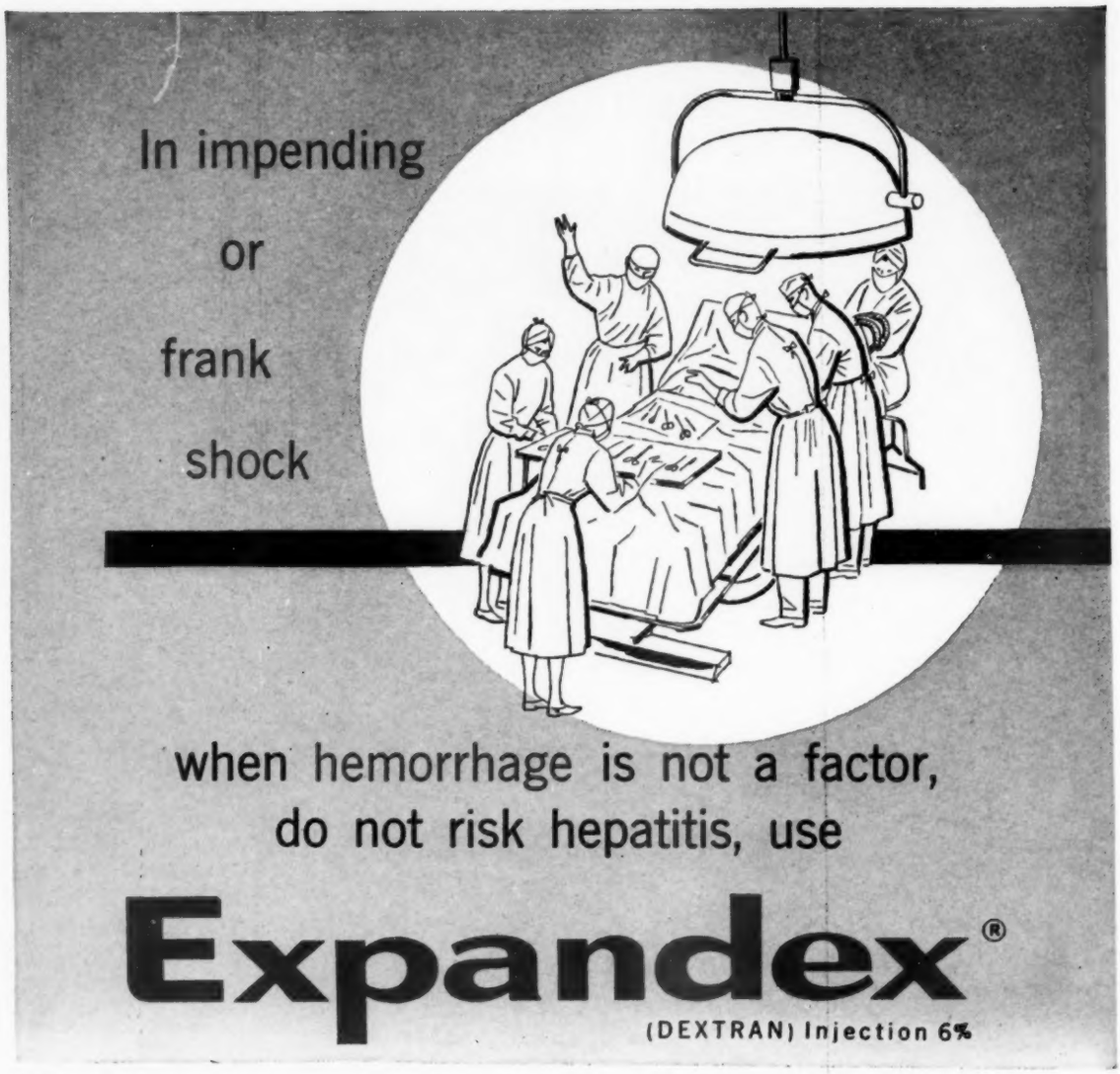

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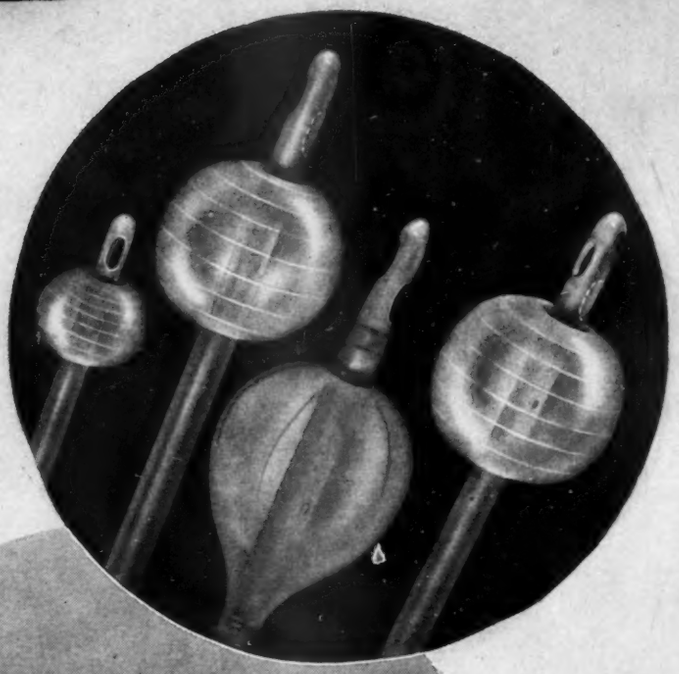

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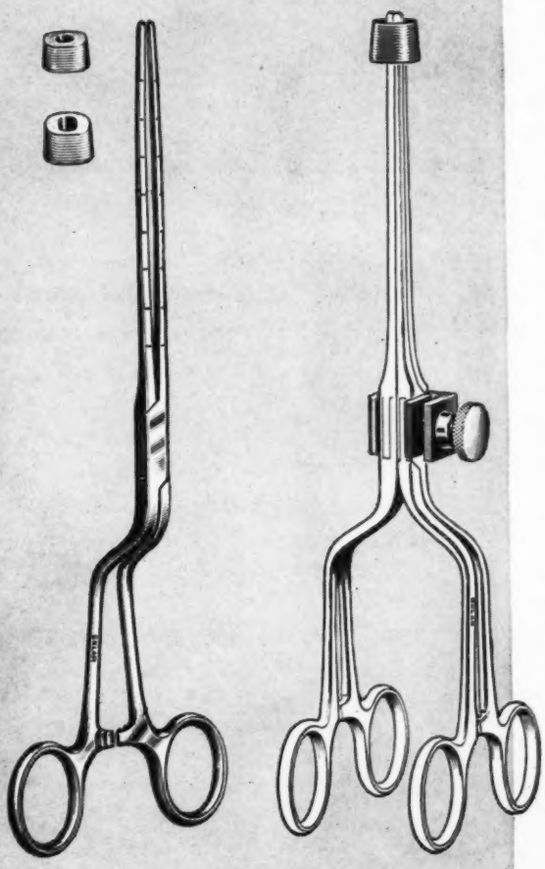

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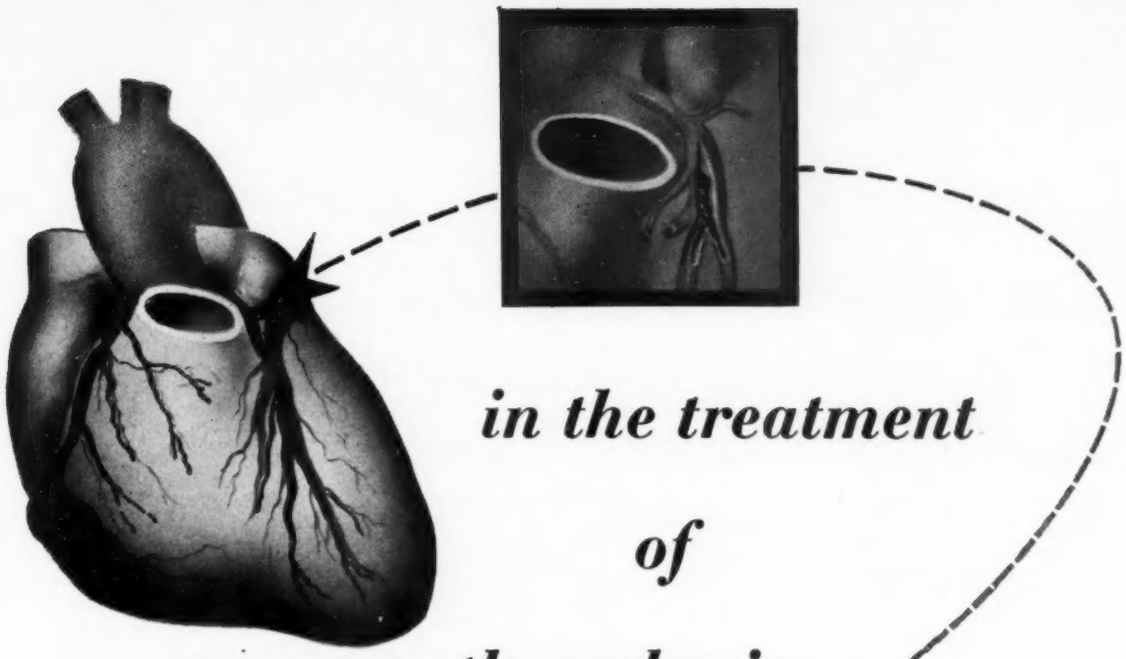

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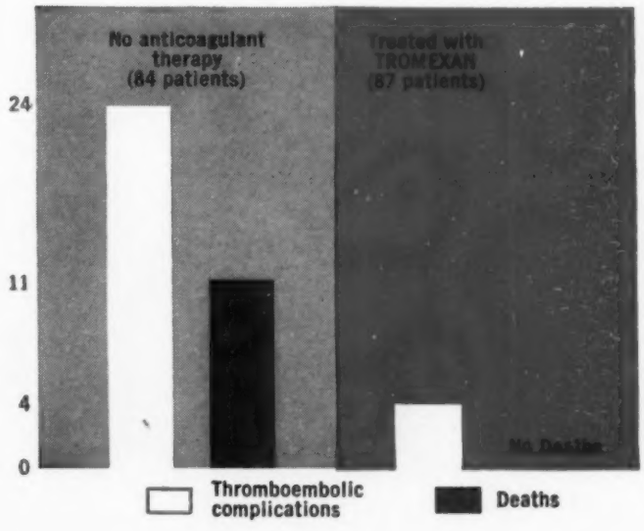

1. Tulloch, J. A., and Gilchrist, A. R.: Tromexan in the Treatment of Coronary Thrombosis, Am. Heart J. *42*:864, 1951.

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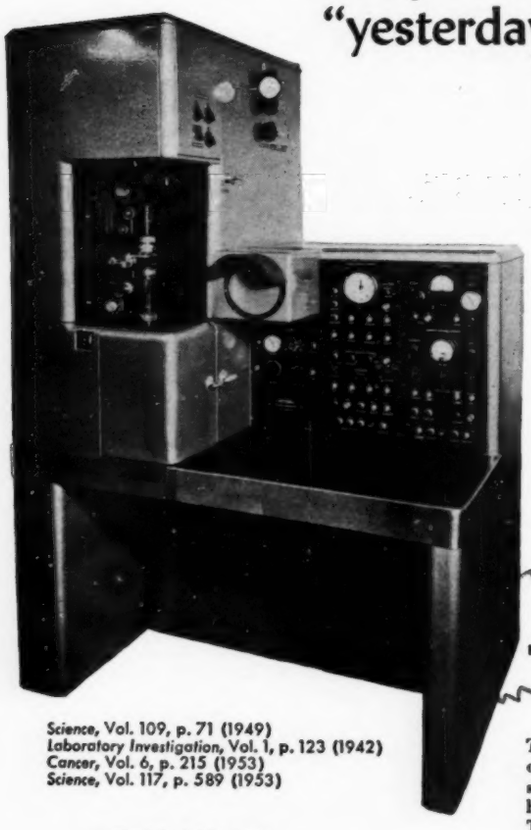

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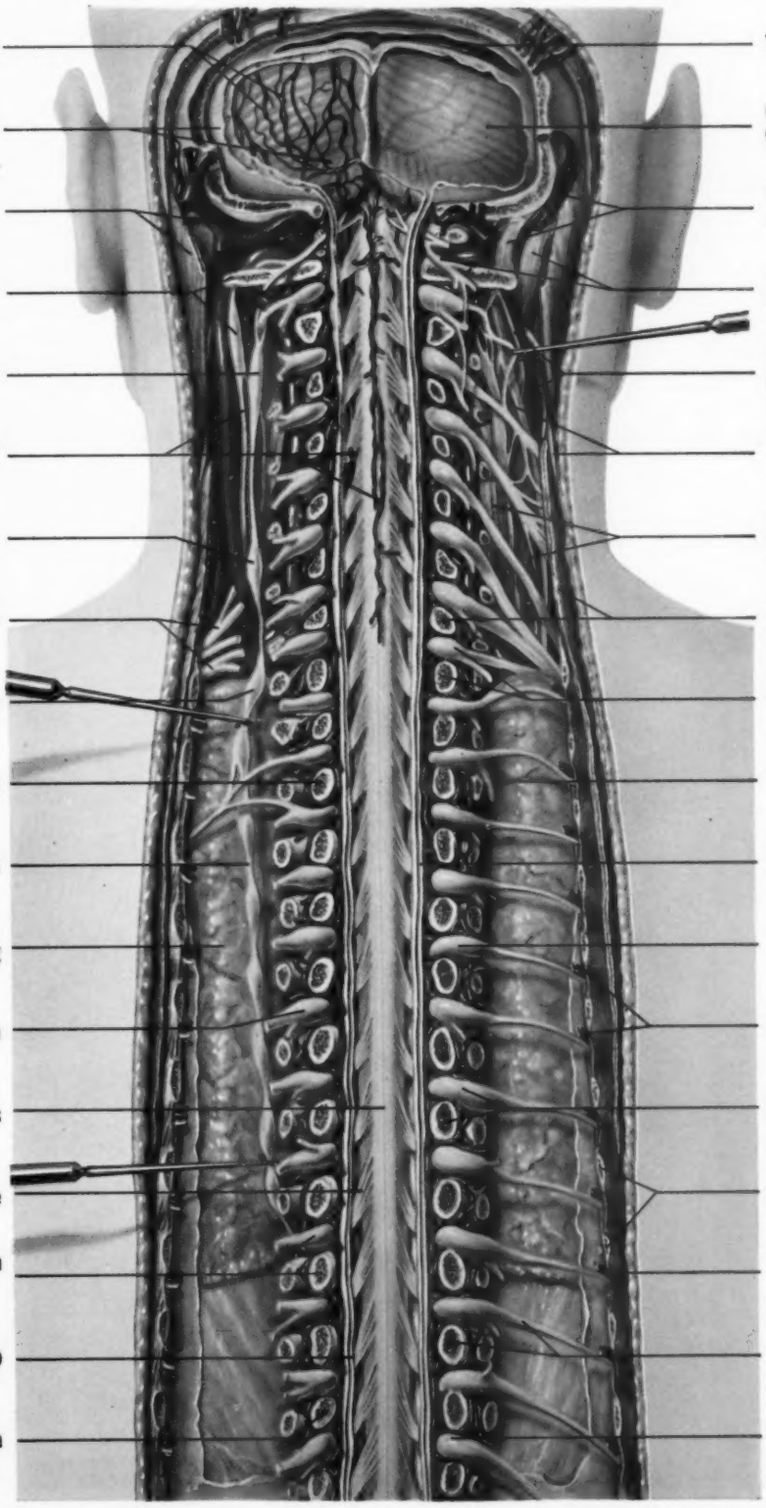
Inferior cerebellar veins
Cerebral dura (cut); post. inf. cerebellar artery
Sternocleidomastoid muscle; deep cervical vein
Transverse process of atlas; nodose ganglion
Sup. cerv. ganglion
Vagus nerve; post. spinal artery and vein (cut)
Middle cerv. ganglion
Brachial plexus
Inf. cerv. ganglion
Third thoracic vertebra
Sympathetic trunk
Left lung
Sixth thoracic ganglion
Posterior median sulcus
Post. root, ninth thoracic nerve
Ninth thoracic ganglion; tenth thoracic vertebra
Arachnoid (cut)
Twelfth thoracic vertebra
Transverse sinus
Cerebellum (covered by arachnoid)
Rectus capitis lateralis m.; occipital a. and v.
Digastric muscle; first cervical nerve
Hypoglossal nerve; internal jugular vein
Accessory nerve; internal carotid artery
Anterior scalenus muscle; common carotid artery
Seventh cervical vertebra; trapezius muscle
Eighth cervical ganglion; first thoracic vertebra
Right lung
Spinal dura mater (cut)
Fifth thoracic ganglion
Intercostal arteries and veins
Seventh thoracic ganglion; eighth thoracic vertebra
Ribs (cut)
External intercostal muscle
Tenth thoracic nerve; eleventh thoracic vertebra
Twelfth thoracic ganglion

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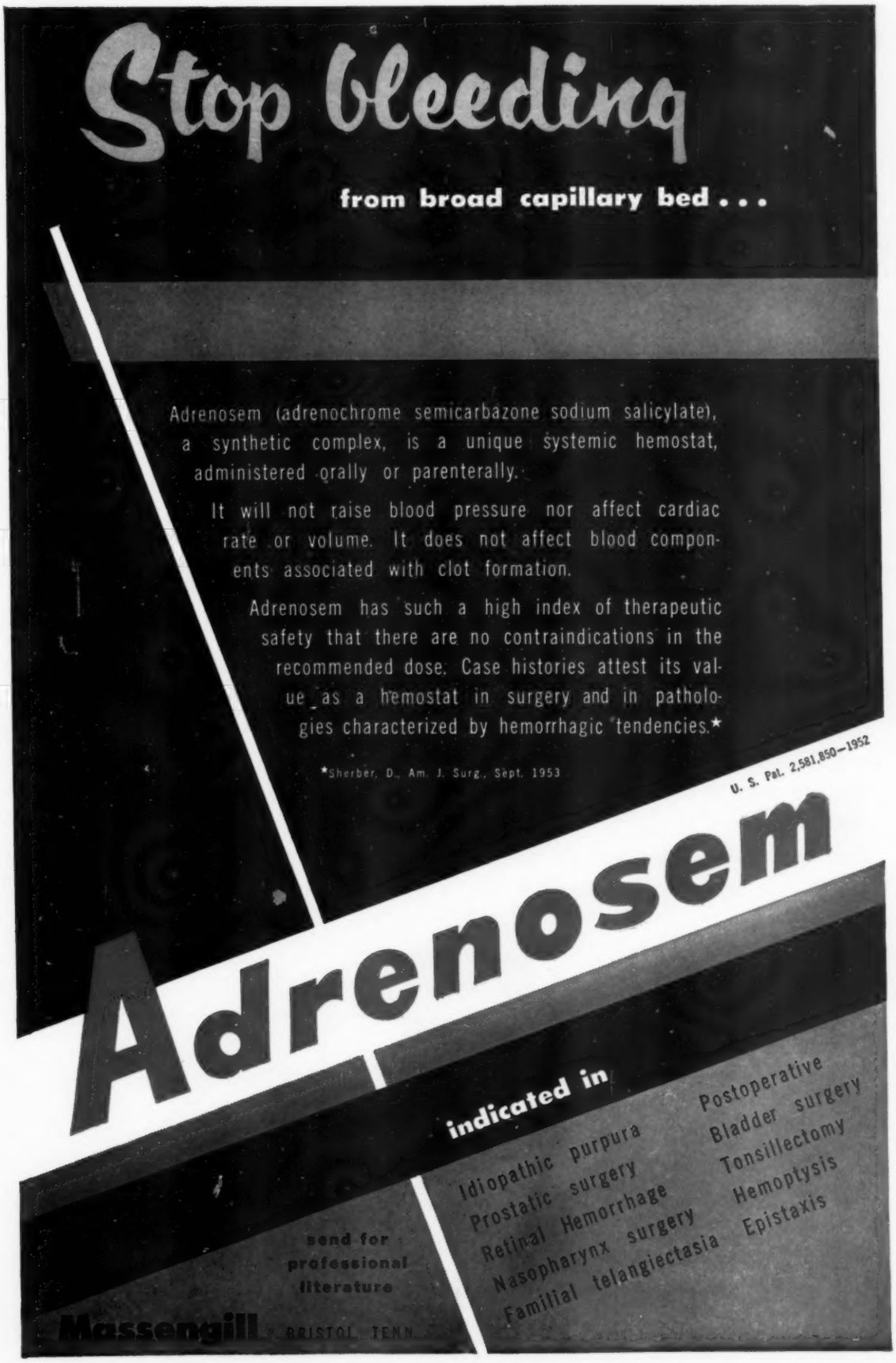
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*Sherber, D., Am. J. Surg., Sept. 1953
U. S. Pat. 2,581,850—1952
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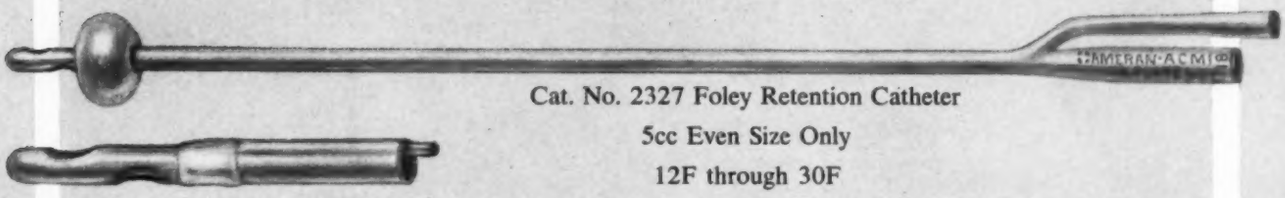

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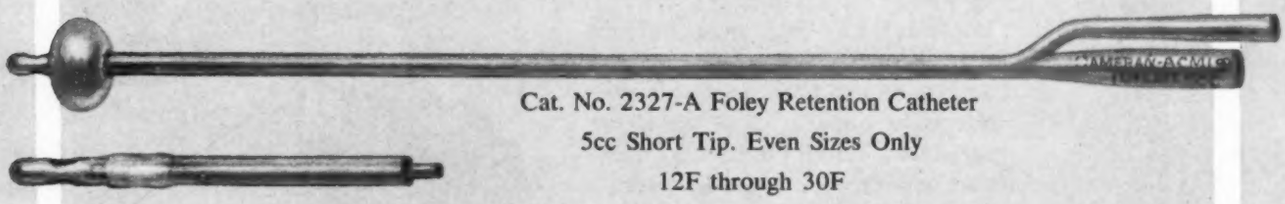

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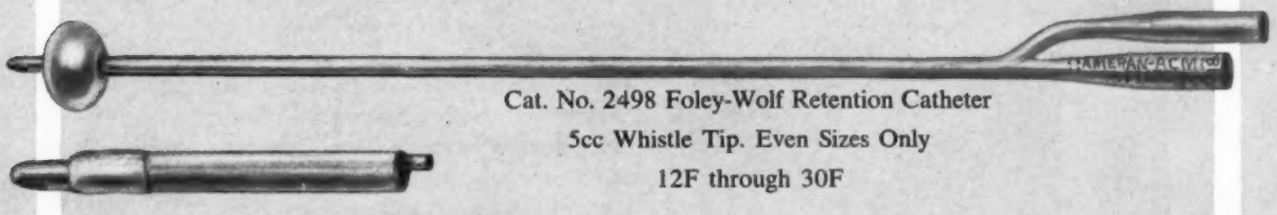

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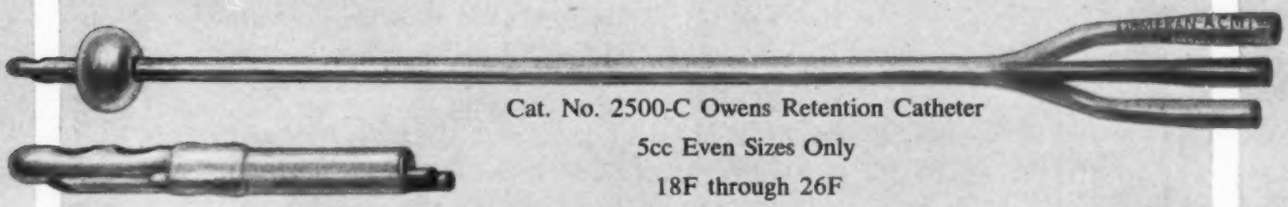

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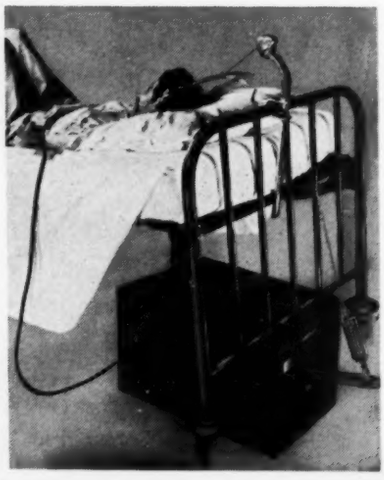

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Deucher, F.: Schweiz. med. Wchnschr. 82:1 (Jan. 5) 1952.

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Farley, W. J., Konieczny, L.: J. Pediat. 42:177 (Feb.) 1953.

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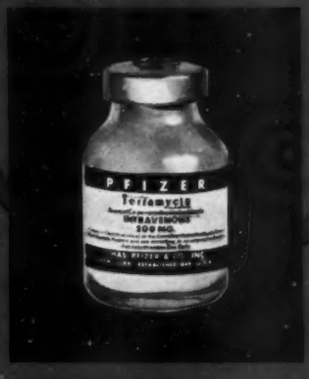

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Reiss, E., et al.: A. M. A. Arch. Surg. 64:5 (Jan.) 1952.

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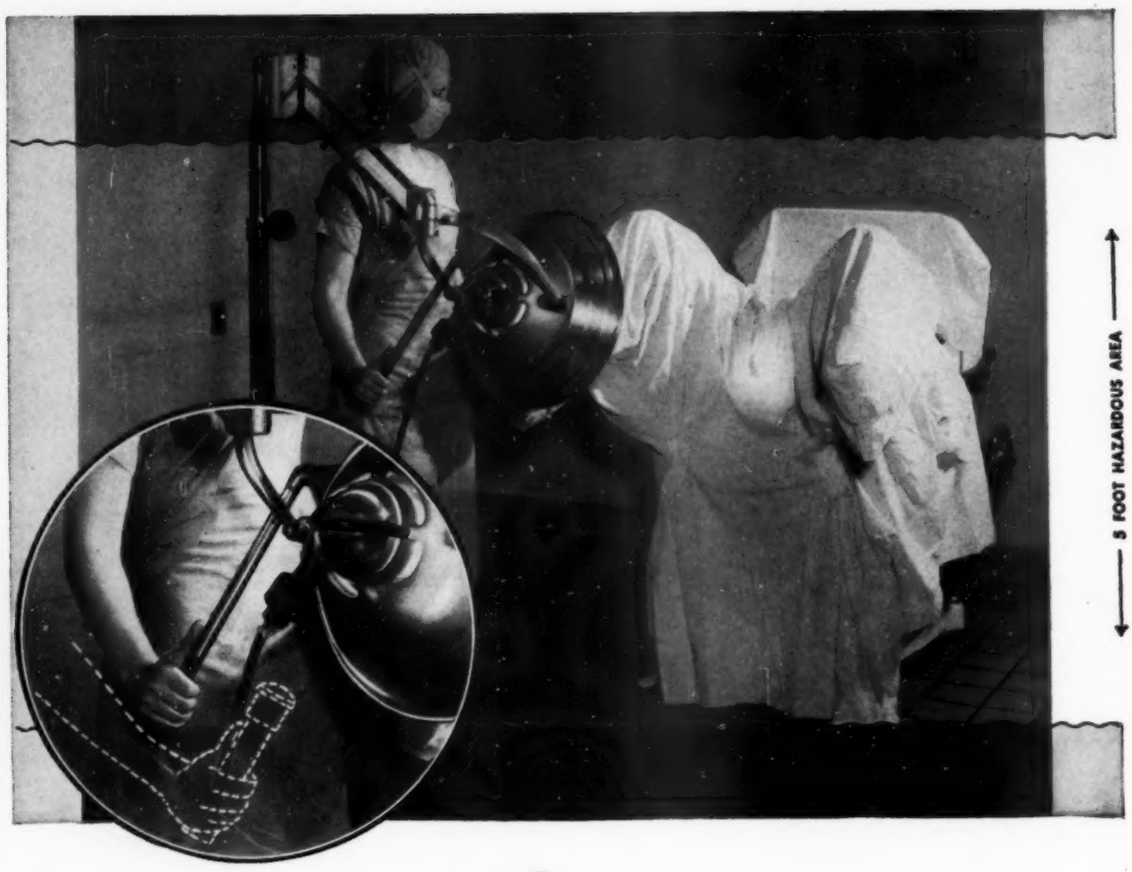

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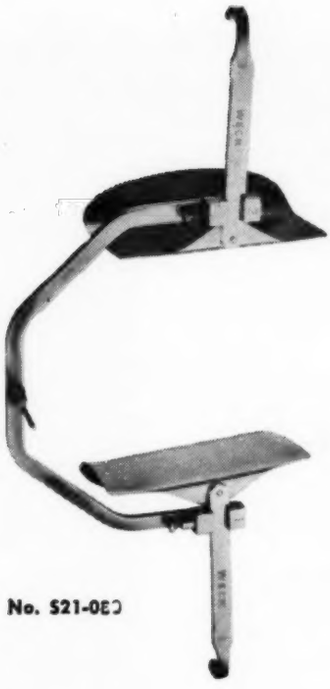

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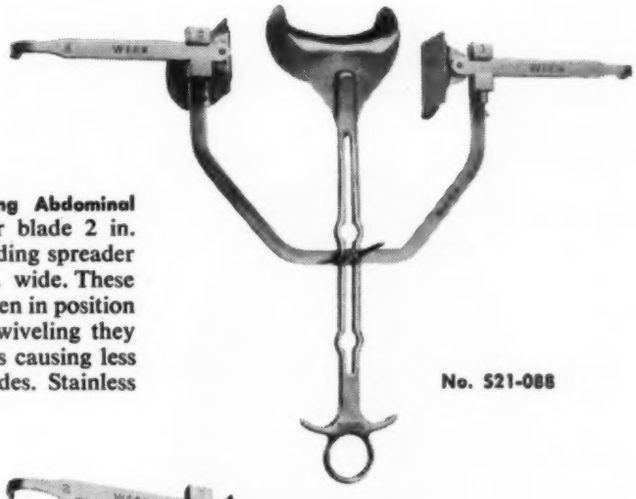

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Sixty-second Year of Publication

VOL. LXXXVI OCTOBER, 1953 NUMBER FOUR

Editorial

DR. FRANK LAHEY

A DYNAMIC personality has passed from the stage of American Surgery. A great individual has succumbed to the ravages of time. No more will his voice be heard in the counsel of surgical progress; no more will his aggressive mind contribute new and constructive thought to surgical achievement. His counsel and advice will be greatly missed. He stood in the field of surgery like a giant oak in the forest of surgical advancement. Great men in life are like the tremendous trees that stand out and tower above all others. One often wonders what contributes to the development of such oaks that stand above those around them. They all draw their sustenance from the same type of soil, receive the same amount of rainfall and the same degree of sunshine, but here and there is one which stands above all those in the surrounding forest. There can be but one answer. It is not related to the soil, the rainfall, the sunshine or the environment but to the unknown quality of the acorn itself. Something existed in the germ seed that regardless of environment it was destined to become an oak which by its gigantic proportions attracted at once the attention of all who passed its way. This well exemplifies the outstanding stature of Dr. Frank Lahey. He stood as a giant in the field of surgery and all who passed his way stopped to admire and revere. There was something within him that could not and would not be deterred. The talents that were inherent within him were destined to full culmination. These were many and were stimulated to full maturity by an indomitable zeal and by persistent application. They had been progressively developed to a point where each stood out as a monument to his great mental capacity. Few have possessed so many qualities for attainment and few have developed them to such a degree of perfection.

As a surgeon, with an almost endless list of contributions to surgical progress, his influence was great for many years. There are few who have contributed so much to surgical advancement and stimulated so many in surgical thought. His mind constantly was seeking new approaches to surgical problems and new conceptions of the effect of disease.

As a teacher and lecturer he could not be excelled. He contributed enormously to the advancement of surgery through the medium of the scientific platform. His talents were always in demand and the attendance was related only to the capacity of the Assembly Hall.

His talent as an organizer and evaluator of able cooperative personnel is well attested to by the renowned clinic which he established. The steady expansion of this facility and the extent to which it has become a center for postgraduate education is a monument to his organizing, executive and scientific ability. He kept his lights trimmed and burning and never hid his talents under a bushel.

At the recent meeting of the American Goiter Association he conducted a never to be forgotten panel on thyroid disease. It was my pleasure as President to present to him the Meritorious Award of that Association for distinguished service in the field of thyroid disease.

In acknowledging this recognition he made one of the most powerful addresses of a long career, emphasizing principally the necessity for professional unity and cooperative relationship. This was recorded and will appear in the proceedings of the Association. It will be well worth reading.

It is difficult to realize that Dr. Lahey is no longer with us. I, personally, feel his passing very deeply. To me he has been a friend of long-standing, a wise counselor and a great stimulating influence. He fulfilled the ultimate purpose of life; he has left the world better by having lived in it. He stood for high attainments, for professional unity and for scientific advancement. He was weighed in the balance and was not found wanting.

CLAUDE J. HUNT, M.D.

Original Articles

TREATMENT OF WOUND INFECTIONS WITH FURACIN SOLUBLE POWDER*

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A REVIEW of the surgical literature in recent years could lead the reader to believe that topical infections are no longer a serious problem. It would appear that perfect aseptic surgical technic, coupled with the prophylactic systemic administration of antibiotics, has made such conditions non-extant.

Such has not been the experience in our hospital. Although these infections are not common, they do occur in spite of antibiotics and good technic, and they often prove extremely refractory to treatment. Failure of such infections to respond to systemic antibiotics is to be expected due to the limited antibacterial spectra of many of these drugs, rapid development of bacterial resistance and to the fact that blood-borne agents cannot well be expected to become sufficiently concentrated in a lesion, especially if a pyogenic barrier or scar tissue exists. Topical antibacterial therapy is therefore logical.

However, routine use of systemic antibacterial agents for topical application is now considered inadvisable since it may lead to bacterial resistance and to sensitization which can prevent their systemic administration for serious infections in the future. It is advantageous to use drugs which are never employed systemically. Therefore we welcomed the availability of furacin,® brand of nitrofurazone N.N.R., for use in such surface infections. This drug has a wide antibacterial spectrum including many gram-negative as well as gram-positive organisms;[1] although a bactericide it has negligible toxicity for mammalian tissues.[2] It is usually applied in the form of furacin soluble dressing N.N.R. or furacin solution N.N.R., but we recently had the opportunity of employing a modified dosage form of the drug. Instead of a mixture of carbowaxes producing a soft base of ointment-like consistency, the vehicle of this new dosage form is a higher carbowax (6000) which resembles hard wax. It contains furacin, 0.2 per cent, and is ground to a soft, impalpable yellow powder which is completely water-soluble. This new form offers some physical advantages over furacin soluble dressing in that it is more readily applied to a lesion by sprinkling from the shaker-top vial or by the use of a non-metallic powder insufflator.

In order to evaluate the efficacy of this preparation it was used in a series of eighty-six cases of various types of wound infections. The majority of the cases were postoperative as indicated in Table I. Bacterial cultures of the wounds were made, and all other antibacterial medication was discontinued in those cases in which such therapy was being received. Furacin soluble powder was then applied topically two or three times a day for five to fifteen days, with an average of eight days. Bacterial cultures were repeated every third day until the wound was healed.

The excellent results obtained are summarized in Table I. Although 87 per cent of all the patients had infections that were refractory to previous therapy, 91 per cent of the cases responded favorably to the furacin powder. Table II lists the various organisms that were cultured from the wounds, many of which were resistant to antibiotics. Healed and sterile wounds were obtained in 76 per cent and definite clinical improvement was noted in 15 per cent of the

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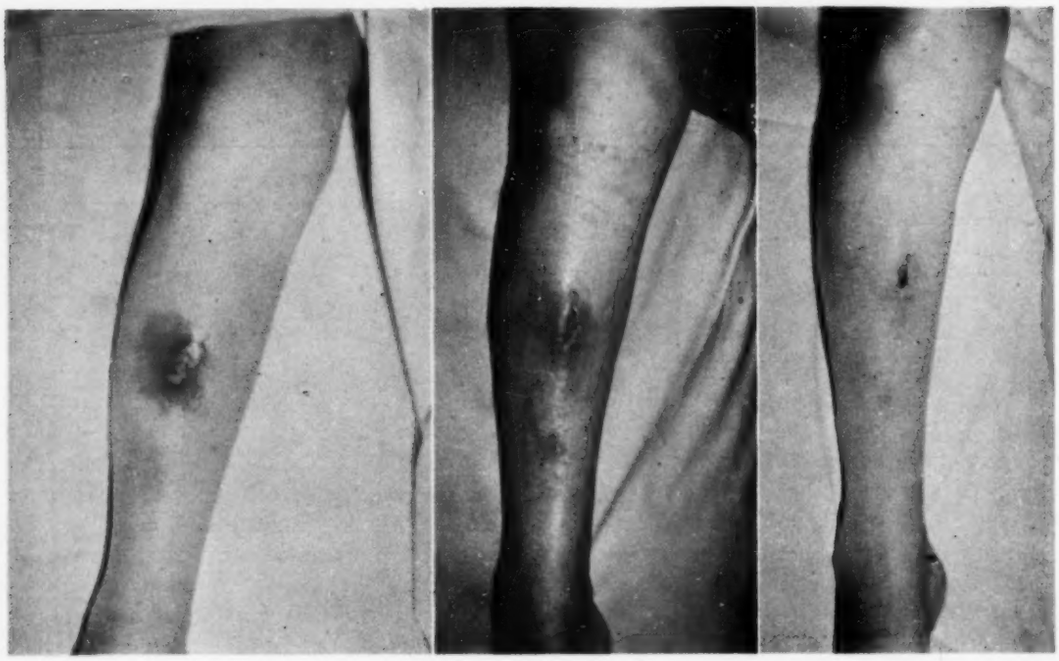

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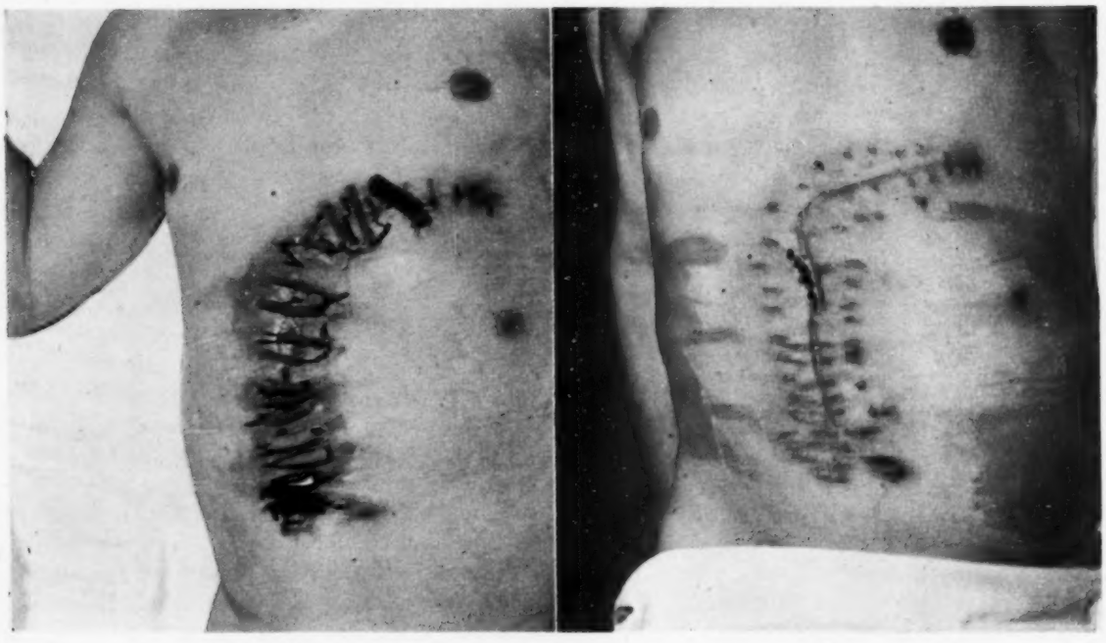
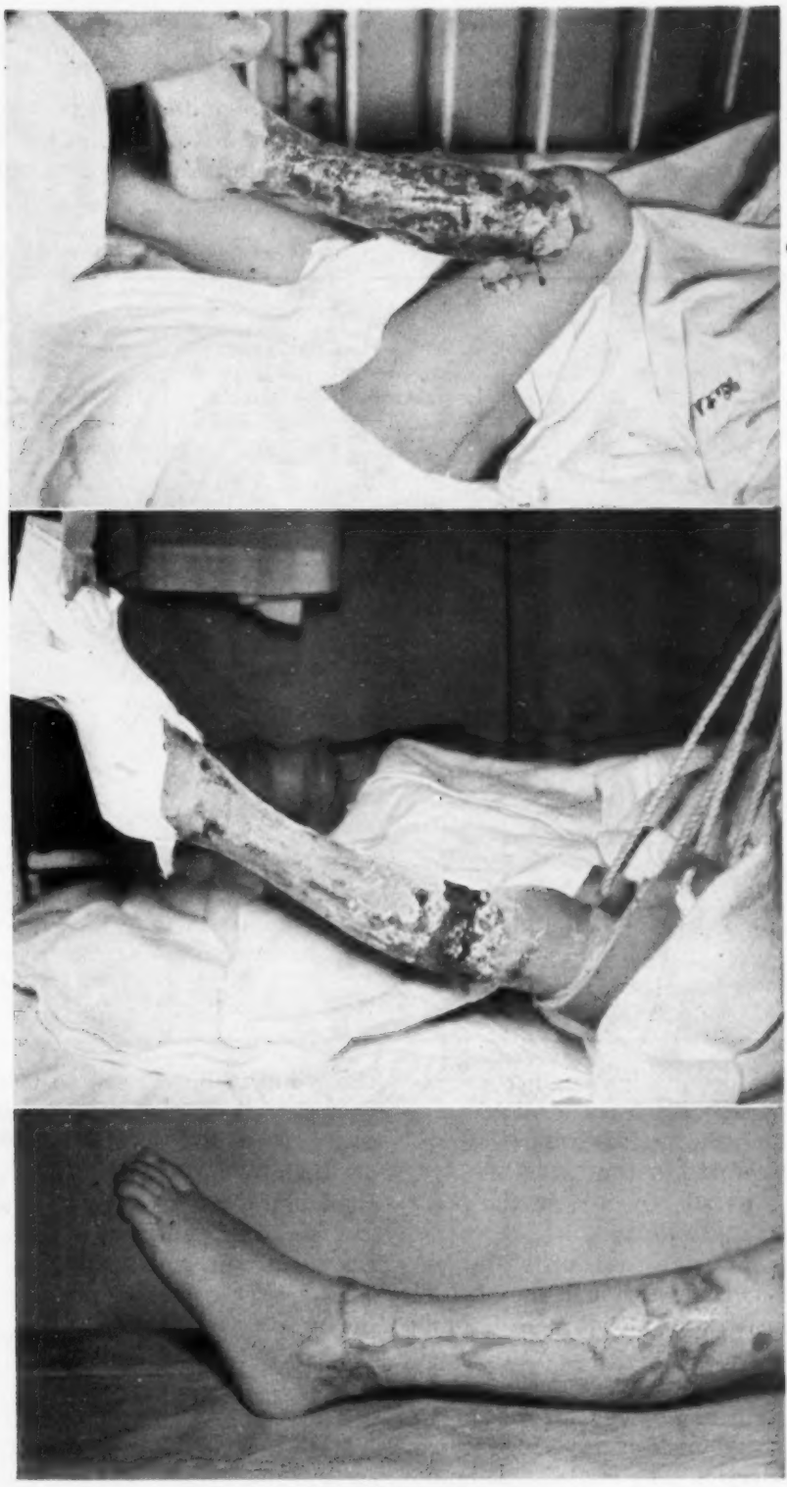
FIGS. 1 to 3. Infected hematoma.



4 5

FIGS. 4 and 5. Wound infection.



Figs. 6 to 8. Burn case.

total number treated with furacin soluble powder. In those wounds that responded to treatment acceleration of the healing rate was noted within forty-eight hours. The odor and drainage diminished and the advance of the epithelial border became evident. In the cases of chronic decubitus ulcer which has become refractory to previous extensive antibacterial treatment including the antibiotics, fresh granulation tissue appeared within several days. The drug retains its effectiveness in the presence of pus, blood and exudates.

In no case has any sensitization to furacin soluble powder occurred. Although the over-all incidence of sensitization to furacin soluble dressing is approximately 5 per cent, such sensitization usually appears in dermatologic patients rather than in surgical infections. We have minimized this danger by applying furacin only until the infection was eradicated. Some cases of sensitization reported in the literature have resulted after daily application for many weeks. We consider it inadvisable to apply any antibacterial agent topically for such prolonged periods of time.

Blood counts and urinalyses showed no abnormality indicative of toxic effects from the drug.

We have found furacin soluble powder to have many advantages in the treatment of infected wounds that are kept open to the air. In the group of burn cases so treated the results were excellent. Sensitive wounds are more easily treated by simply sprinkling on the powder than by applying ointments and frequently changing the dressing. This form of furacin exerts a drying effect of weeping skin infections where an ointment would be contraindicated. The powder is soluble and can penetrate into the crevices and depths of a wound much more effectively than an ointment.

TABLE 1

SUMMARY OF CASES TREATED WITH FURACIN POWDER

	Cases Treated	No. Which Had Previous Unsuccessful Therapy	Average No. of Days of Furacin Application	Results		
				Healed or Sterile Wounds	Clinical Improvement	No Improvement
Postoperative wound infections:						
Abdominal	22	20	8	16	4	2
Pilonidal	5	5	9	5	0	0
Hemorrhoidal	3	3	7	3	0	0
Ulcer						
Decubital	11	11	12	7	2	2
Varicose	5	5	9	4	0	1
Burns	7	6	8	6	1	0
Avulsion injury	3	3	6	3	0	0
Compound fracture wounds	4	4	11	3	0	1
Skin grafts	8	6	8	5	3	0
Abscesses						
Carbuncle	6	4	9	5	1	0
Rectal	4	3	6	3	1	0
Pyogenic dermatitis at site of:						
Colostomy	3	2	7	2	0	1
Ileostomy	3	1	7	2	1	0
Fistula	2	2	8	1	0	1
Total	86	75(87%)	8.3	65(76%)	13(15%)	8(9%)

CASE REPORTS

CASE 1. This sixty-four year old woman had an infected hematoma of the leg following trauma. The lesion was incised and drained. Topical antibiotic therapy, employed for three days, failed to decrease drainage of pus. (Fig. 1.)

Furacin soluble powder was then applied

three times a day for six days. Drainage ceased in four days and good granulation tissue had developed by the fourteenth day postoperatively. (Fig. 2.) Healing was practically complete on the twenty-eighth day. (Fig. 3.)

TABLE II
BACTERIA ISOLATED FROM WOUNDS OF EIGHTY-SIX PATIENTS

Organism	Total Isolated	
	Number	Per cent
Micrococcus (Staph.) pyogenes aureus	33	38
albus	11	13
Streptococcus pyogenes (hemolytic)	21	24
(non-hemolytic)	12	14
Proteus species	20	23
Pseudomonas aeruginosa (pyocyanea)	16	19
Escherichia coli	13	15
Corynebacterium sp. (diphtheroids)	5	6
Aerobacter aerogenes	4	5
Alcaligenes faecalis	1	1
Clostridium welchii	1	1
Diplococcus pneumoniae	1	1

CASE II. This patient was a fifty-two year old man who following splenectomy had a complete wound dehiscence. After secondary closure, in spite of intensive, systemic antibiotic therapy, the wound became infected. Although various systemic and topical antibacterials were administered for several weeks, local infection with pseudomonas and proteus species persisted. (Fig. 4.) Furacin soluble powder, three times a day, eradicated the infection within ten days. (Fig. 5.) Recovery was complete and uneventful.

CASE III. This four year old boy sustained second and third degree burns of the left leg and was treated at home for three weeks. A local secondary infection with Bacillus proteus and Pseudomonas aeruginosa then developed, which failed to respond to other antibiotic therapy. (Fig. 6.) Following local application of furacin soluble powder the infection subsided (Fig. 7) and the wound was successfully grafted. (Fig. 8.)

SUMMARY

A group of eighty-six infected wound cases was treated locally with furacin soluble powder. Of these, sixty-five wounds healed or became sterile within a period of two weeks and thirteen showed marked clinical improvement. The remaining eight cases did not respond to the therapy. Most of these cases were completely refractory to antibiotic therapy, and wound cultures showed the bacteria to be resistant to other antibacterial drugs.

This preparation is a valuable agent in the local treatment of infected wounds and has many advantages in certain types of cases over the ointment form of the drug.

No evidence of toxicity or sensitivity developed in any of the patients treated.

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ANESTHESIA FOR SURGERY OF THE THYROID GLAND*

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DISTURBANCES of the thyroid gland, of necessity, render the administration of anesthesia for operations on this structure different from that performed for operations in other localities of the body. The major differences lie in the anatomic position of the gland and in its physiology which is so intimately connected with the workings of the organism as a whole.

From an anesthetic point of view the toxicity and the size of the thyroid gland markedly affect the choice and type of anesthesia. If the thyroid is of a non-toxic variety and of moderate size, the problems associated with its management are no more complicated than those of any other operative procedure on other parts of the body. In thyroid surgery of any kind, however, because of the structure's close approximation to the breathing apparatus, the anesthesiologist must take special precautions to protect the airway from obstruction.

PHYSIOLOGY AND PHARMACOLOGY

The chief function of the thyroid gland is to maintain the normal rate of body metabolism and to regulate this rate according to the body's needs. In thyrotoxicosis, as Boyd succinctly states,[1] "there is an enigma present—one which constitutes one of the most perplexing problems in the whole of medicine, for it provides an example of an organ starting and continuing to hyperfunction *without* any regard to the needs of the body."

Compounds that possess antithyroid properties fall into two general categories: those which act without producing goiter, of which iodine and radio-iodine are examples, and those which cause marked hyperplasia and at the same time depress thyroid function; the latter embrace the cyanides, thiocyanates, sulfonamides and thiourea.

Iodine by means of its "iodinating action"[2] supplies an essential ingredient for thyroid economy. The formation of thyroxine is believed to involve the iodination of tyrosine to di-iodotyrosine which, by the addition of two iodine molecules, forms thyroxine. In hyperthyroidism the rapid manufacture of thyroid hormone creates an iodine uptake by the gland two or three times that of normal persons. If supplementary iodine is not provided at this point, the gland becomes hypertrophic and hyperplastic. The administration of supplementary iodine in daily doses of 6.0 mg. or more meets the demands of increased hormone production, the "hypertrophy of frustration" is no longer necessary and the thyroid regresses toward normal. This second action, namely, the diminution in size and vascularity, is known as the "involuting action" of iodine on a hyperfunctioning thyroid.

Under "antithyroid" drug treatment (viz.: thiouracil, propylthiouracil, etc.) the hyperplastic gland in Graves' disease becomes more hyperplastic. These drugs act by preventing the formation of excess thyroxine either by enzyme inhibition or by binding free iodine produced in the acinar cells before hormone synthesis can occur.[3] The stimulation by the thyroid-stimulating hormone of the anterior pituitary continues, however, and the gland reflects this stimulation by increasing hyperplasia. In spite of the fact that the "antithyroid" drugs prevent the utilization of iodine for hormone synthesis, supplementary iodine still causes involution of the hyperplastic "antithyroid" treated gland in Graves' disease. Therefore, it is concluded that iodine exerts an iodinating and involuting action on the gland in toxic thyroidism and that these two actions can be separated by means of thiouracil or its allies.

PREPARATION OF THE PATIENT

It is of the greatest importance that the patient be prepared properly for thyroid surgery,

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particularly if there is toxicity present. Evaluation of the risk must enter into every consideration of the anesthesiologist and the surgeon in planning proper procedure in each case. Woodbridge[4] has given a classic example for evaluating patients with thyrotoxicosis. He said, "Each of the following factors is of unfavorable prognostic significance: age of forty years or over; duration of disease greater than one year; loss of more than one-fifth of the body weight; failure to gain weight during the pre-operative period of rest; iodine (and thiouracil) treatment; failure of pulse rate to drop to 100 or below during the preoperative period; high basal metabolic rate before treatment and failure of the rate to show a good drop under treatment to a level of less than plus fifty; vomiting or diarrhea; marked physical restlessness and failure of pre-operative narcotics to produce the usual sedation." Thus any and all of these factors must be considered before the patient comes to surgery.

The use of the potent goitrogenic drugs (such as propylthiouracil and methimazole[5] preoperatively has resulted in the achievement of the goal of having the patient practically euthyroid before operation and rendering two-stage thyroidectomy no longer necessary. Preparation with these drugs aims at reducing the metabolic rate to a point comparable with normal activity. Metabolic rate, of course, is an exact index of the patient's oxygen consumption and reflex irritability level, the latter two factors being the cause of resistance to anesthesia induction.[6]

The preparation of the patient, in general, consists of adequate bedrest, high caloric and high vitamin diet, propylthiouracil in adequate dosage (300-800 mg. per day) followed by Lugol's solution, 10 minims, three times a day, for seven to ten days in order to involute the hyperplastic gland and obviate the annoying bleeding encountered at surgery if this step is eliminated. The utilization of preparatory anesthetic drugs prior to surgery to "steal the gland" is no longer considered justified since we have instituted the aforementioned preparation of the patient. Formerly, it was necessary to utilize basal narcosis by means of avertin® (tribromoethanol) or thiopental sodium in an effort to reduce metabolism further. Caution must be used in ordering sedation in these now euthyroid individuals.[7] Morphine sulfate, 0.010 to 0.015, plus scopolamine or atropine, 0.0004 to 0.0006, depending on the patient's size, sex, etc., is adequate preoperative sedation.

METHODS OF ANESTHESIA

The choice of the method of anesthesia is important in many respects. For many years anesthesiologists considered thyrotoxic patients poor subjects for general anesthesia, whether inhalational, rectal or intravenous. It was believed that the toxic patient was not a sufficiently labile subject for the alterations in metabolism that general anesthesia produced. Many of the toxic patients were carried safely through their operation and postoperative period by employing regional nerve block anesthesia. The less toxic variety, or the simple goiters, could be managed by inhalation anesthesia.

The agents used in inhalation anesthesia are many. They are divided into gaseous and volatile agents.

Gaseous Agents. Cyclopropane: This agent no longer holds favorite position. At its inception it was considered a boon to thyroid anesthesia because it could be administered to the patient with such great excess of oxygen. However, after extensive use its deleterious (or toxic) action on the heart muscle became evident. Frequently extra systoles had been noted and fatal ventricular fibrillation has occurred even within the normal anesthetic range. In thyroid surgery we now limit its use to induction because of its pleasant and rapid action. Immediately following induction ether is added for maintenance and the cyclopropane concentration reduced to a minimum or discontinued. Occasionally cyclopropane may be used throughout operation for thyrotoxicosis, with slight additions of ether.[8] All inhalational methods are accomplished with the closed, carbon dioxide absorption method of Waters.

Nitrous oxide: This agent may be used in the non-toxic variety and to some extent in the moderately toxic patient. Because of its impotence, however, it must, of necessity, be administered with a minimum of oxygen. The disadvantages are easily apparent when it is realized that the need for oxygen is an essential component of hyperthyroidism and the deliberate reduction of the oxygen supply to the patient would obviously not serve his best interests. Nitrous oxide may be used as an induction agent followed by ether or a combination of thiopental, intravenously, and a 50 per

cent mixture of nitrous oxide and oxygen by inhalation may be used successfully.

Ethylene: This agent may be administered with a higher percentage of oxygen (25 per cent). It has been used extensively and has served well in many clinics. The cardiac muscle is not affected, no change in rhythm is noted and there is no increase in irritability without superimposed hypoxia or anoxia.[9,10] Ethylene may be used as the sole anesthetic agent or used only for induction, with ether maintenance.

Fire and explosion: The ever present danger of fire and explosion must be kept in mind when using gaseous or volatile anesthetic agents alone or in combination. The non-flammable agents used in inhalation anesthesia are nitrous oxide, chloroform and trichlorethylene (trilene®) in air. The flammable agents are: ether, ethylene, cyclopropane, divinyl oxide (vinethene®) and ethylchloride. The mixture of these agents with oxygen and the concentration used for anesthetic purposes is always within the range of explosibility. Precautions should be taken to avoid any source of ignition spark during the administration of flammable agents. Static spark is the most frequent cause of explosions and usually occurs at the site between the rubber mask and the patient's face. Extraneous spark may be engendered and cause explosions by the use of high frequency electrical equipment used in operating rooms, or by the use of the actual cautery.[11] Methods of prevention entail the avoidance of obvious sources of ignition while an explosive anesthetic mixture is being employed. Static spark may be prevented by following the recommendations of the U. S. Bureau of Mines[12] concerning adequate grounding of operating room floor, use of conductive rubber both on anesthetic machine and anesthetists' shoes, maintenance of a relative humidity of over 55 per cent and thorough wetting down of rubber mask and connecting tubes of the anesthetic machine previous to their use. The Horton intercoupler is found useful in many clinics. It is an arrangement whereby the four units of the operating room team—the anesthetist, gas machine, patient and operating table—are kept in the same electrical potential, thus preventing the occurrence of sparks between any of the four components. However, sparks may occur between any member of the intercoupled group[13] and a nearby charged object. Therefore, precautions must be taken to prevent contact of this group with any outside source of static electricity such as might be obtained on operating room personnel, visiting physicians, etc. Explosions resulting in fatality have occurred and will continue to occur if carelessness is tolerated.[14]

Volatile Agents. Chloroform: This agent is not useful in goiter surgery. The irritability of the myocardium is increased and it may be depressed directly. Ventricular fibrillation is encountered most frequently with this agent and "sudden death" is too common. Despite the findings of the Wisconsin group[15] we are loathe to reintroduce chloroform into modern anesthesia in America.

Ethyl chloride: This agent, too, has cardiac effects that are undesirable in which irritability may be increased, resulting in ventricular fibrillation.

Divinyl oxide (vinethene): This drug has not had sufficient trial to warrant its use in goiter surgery (Adriani).

Ether: It has been well said that it is fortunate that ether was the first anesthetic agent discovered since it happens to be the safest. The pendulum is swinging back more and more to its use; and if it is properly administered, there is no better agent. Induction, as previously stated, may be accomplished by the use of the gaseous agents and maintenance accomplished with ether. During ether anesthesia the cardiac output is increased and there are no deleterious myocardial effects, provided anoxia is avoided. Anesthesia is best maintained in the first plane of the third stage, keeping the patient as near physiologic normalcy as possible. Balanced anesthesia with the gases and thiopental intravenously, with small additions of ether, appears to be very useful and a way in which troublesome reflexes may be kept to a minimum.

Miscellaneous Agents. Pentothal® thiopental sodium: The intravenous administration of this barbiturate for thyroid surgery has been used on many occasions. Naturally, the same precautions regarding the patient's airway must be observed with this agent as with any of the inhalation methods. The dilute solutions of thiopental are preferred.[16] *Our procedure* at present consists in the following steps: (1) 0.2 per cent thiopental solution is prepared by dissolving 1 gm. of thiopental in 500 cc., 5 per cent, dextrose and water. (2) This solution is permitted to flow at a rate of 60 to 80 drops per minute until the lid reflex is abolished at which

point a previously prepared solution of anectine® (succinylcholine chloride)* 300 mg. in 500 cc. of normal saline (.06 per cent) is begun. (3) The anectine is infused slowly (30 to 40 drops per minute) until the masseter muscle is relaxed; at this point the larynx is visualized by means of a MacIntosh laryngoscope to avoid the possibility of spasm of a pentothal-sensitized larynx, and sprayed liberally with a 2 per cent pontocaine® solution. (4) Following this topical anesthetization of the larynx, a Murphy cuffed endotracheal tube is passed through the larynx and into the trachea and the free end is attached to the machine and anesthesia maintenance continued with 50 per cent nitrous oxide-oxygen mixture and small amounts of 0.2 per cent thiopental.

The advantages of dilute thiopental in thyroid surgery are many.[17] It does not seriously depress the blood pressure or interfere with the compensatory vascular reflexes or excite cardiac arrythmia. It lowers the metabolic rate. As Hudon has stated,[18] "Pentothal because of the resemblance of its molecule to the thiourea derivatives may possess an anti-thyrotoxic principle *per se* and perhaps is responsible for the favorable outcome following its use in toxic patients."

CONTROL OF THE AIRWAY

Inasmuch as the site of operation is always about the patient's airway, the maintenance of the patency of the airway during surgery and for some time thereafter is of the utmost importance. An endotracheal tube will be extremely valuable in maintaining the patency if there is any reason to consider the possibility of the patient's respirations at any time becoming obstructed. This is particularly true in operations upon large goiters with tracheal deviations or in the intrathoracic type in which mechanical difficulty will be experienced in their removal and which may entail excessive pressure upon the trachea. In addition, when there is any disturbance about the vocal cords, either preoperative or postoperative, the introduction of an endotracheal tube will facilitate operating conditions and will render surgery less hazardous. The introduction of the tube may be accomplished after the patient is anesthetized or it may be introduced while the patient is awake, using topical anesthesia. The patient is subsequently put to sleep with the tube in place. As described previously, anectine is very useful in obtaining jaw relaxation by either method. The proper use of the endotracheal tube may indeed be lifesaving and in many instances can tip the balance between success or failure in thyroid surgery. Its routine use in the small or non-toxic goiter, or in the small toxic goiter, is to be avoided. If in the toxic patient no difficulty is expected in regard to the airway, then the introduction of an endotracheal tube will serve no good purpose and may be harmful by initiating laryngeal reflexes of the vagovagal variety which, occurring in a thyrotoxic patient, may result fatally. The introduction of the tube into the trachea must be done properly otherwise harm may result to the structures of the larynx, the pharynx or to the patient's teeth. Skill should be acquired by the anesthesiologist in laryngoscopy and, particularly, bronchoscopy in order that he may perform endotracheal intubation with the proper dexterity.

LOCAL AND REGIONAL ANESTHESIA

In true thyrotoxicosis in which many of the features mentioned by Woodbridge are present, the type of anesthesia used should be chosen very carefully. Long experience with many cases of this type has demonstrated that inhalational anesthesia with any agent is an added burden for the thyrotoxic patient to withstand and should be avoided. There is no general anesthetic agent, whether administered rectally, intravenously or by inhalation, which does not exact its physiologic price of the patient. The thyrotoxic patient will withstand surgery better if he is not put to sleep. With adequate premedication local or regional anesthetic methods exact the least toll of the patient's economy and for this reason have been used when the severity of the disease indicated that the burden of a general anesthetic could not be well borne. Local infiltration in the thyroid area has been successfully accomplished and may serve in place of the more exact technics of regional nerve block. However, regional nerve block is preferred because it gives a more wide-spread anesthesia, adequately relaxes the muscles of the neck and can be performed by the anesthesiologist before the surgeon begins the operation. Local infiltration by the surgeon may be skillfully performed. It somewhat resembles nerve block but the em-

* Supplied by Burroughs Wellcome & Company, Tuckahoe, New York.

ployment of this method by the surgeon necessitates frequent interruptions of the operation itself to infiltrate the structures as they are encountered and, more often than not, becomes more like a "shotgun" method whereby the anesthetic solution is deposited in the tissues of the neck with no regard for its ultimate nerve supply. Local infiltration would consist essentially in injecting the anesthetic solution along the line of incision and then after the skin flaps are open by further infiltration of the muscles overlying the gland. Following this, the anesthetic solution is deposited on the lateral borders of the thyroid and elsewhere, as the need arises, according to the complaints of the patient. This method does not produce the relaxation of the "ribbon muscles" of the neck. Regional nerve block may be performed by blocking the cervical plexus by the lateral or posterior route.[19] The lateral route is preferable and may be more easily accomplished. Regional anesthesia for thyroid operations essentially consists in blocking the anterior and posterior primary divisions of the somatic nerves of the cervical plexus (C2, 3, 4 and 5). We have found the method of Rovenstine and Wertheim[20] to be most useful, although other methods may be employed, e.g., the method of Tovell.[21]

It must be borne in mind constantly that the technic of cervical plexus block is mastered and done with facility only after much practice. Failures may be laid at the door of inexperience. When cervical plexus block is performed properly, thyroidectomy is done with greater ease by the surgeon and with great safety for the patient and the operation is entirely painless. Many thyrotoxic patients who formerly would not have survived the operation under general anesthesia have been carried through surgery safely by this method. Hence, nerve block is best used in the severely ill patient and under adequate premedication with the barbiturates, morphine and scopolamine. The usual duration of anesthesia is over two hours. By utilizing this modality it is not necessary for the surgeon to interrupt the operation to administer intermittent injections of anesthetic solutions. If properly performed, cervical plexus block can be done with a minimum of solution. Usually, 2 to 3 cc. of 2 per cent procaine, at C2, 3, 4 and 5, is sufficient. Thus 16 to 24 cc. produce adequate anesthesia. However, a more dilute solution of procaine (.5 or 1 per cent) may be employed using a greater amount at each root. However, the duration of anesthesia is reduced by diminishing the concentration. This increased amount is helpful to the neophyte. Metycaine® is preferred to procaine in some clinics. More recently we have been using xylocaine 2 per cent and have found more prompt onset and longer duration of anesthesia. With this agent a total volume of 16 cc. is used. We have also effected successful block of the cervical plexus by the epidural route inserting a Touhy catheter at C7, D1 interspace, and passing it up 2 to 3 cm. Usually 2 to 3 cc. of xylocaine, or procaine, will produce an effective block. Usually, of course, both bracheal plexuses participate in the block. This method requires further study but it shows promise.

COMPLICATIONS DURING THE OPERATION

During the course of thyroidectomy complications are prone to arise because of the proximity of the operating site to important structures, viz, the patient's airway, vital nervous pathways and important blood vessels. The anesthesiologist is concerned primarily with maintaining a patent airway during the operation and immediately after it. His interest, furthermore, extends beyond the immediate postoperative period. Any laryngeal, tracheal or pulmonary complications within five to seven postoperative days are considered within his scope.

Airway. Larynx: This is literally the gateway to the lung and it is controlled by muscular action which, at times, may be decidedly dangerous. Laryngospasm may be initiated reflexly from the field of operation during the course of surgery or after it. If it develops, it must be met promptly, and anoxia prevented (in the absence of an endotracheal tube) by positive pressure respiration which forces oxygen past the spastic vocal cords. If this is not sufficient, the spasm may be overcome and anoxia prevented by the swift insertion of an endotracheal tube, or failing this, by tracheotomy. The previous introduction of an endotracheal tube before the operation is started would, of course, avoid this difficulty. Collections of mucus about the larynx may be troublesome and should be aspirated. Aspirations from the tracheal tree are easily accomplished if an endotracheal tube is in place by inserting a small bore, rubber suction tube

through the lumen of the tube. The usual whistle-tip urethral catheter serves this purpose.

Trachea: Tracheal collapse may occur if a previously weakened trachea is subjected to more stress during the operation. This is a serious complication and must be met by prompt introduction of an endotracheal tube or by tracheotomy.

Lungs: The proper supply of oxygen must be assured to the lungs during the course of the operation and afterward. Any obstruction in the airway due to mucus, laryngospasm, etc., must be anticipated and tracheal obstruction, with its consequent anoxia, avoided. An endotracheal tube may be inserted before the operation or, if necessary, during the course of the operation. Pulmonary atelectasis may occur during the operation or postoperatively by the depressed respiration failing to expel a plug of inspissated mucus. This is a serious complication and unless remedied may result in postoperative pulmonary complications or, if it is extensive and involves a large portion of lung structure, may result fatally during the operation. Death is due to severe oxygen curtailment. Bronchospasm may be avoided by the use of adequate atropine premedication or by administering it intravenously during the operation and supplying oxygen under positive pressure.

Carotid sinus syndrome: This reflex may occur during the manipulations by the surgeon and results in the usual triad of bradycardia, hypotension and syncope. The infiltration of procaine through the carotid sheath in the region of the carotid sinus on the affected side, located at the bifurcation of the carotids, at the level of the transverse process of the fourth cervical vertebra, will often terminate this condition.[22]

POSTANESTHETIC COMPLICATIONS

The complications which may occur during the postoperative period are similar to those of the operative period. The difference lies in the accessibility of the remedial armamentarium. During the operation laryngoscopes and bronchoscopes are usually available to combat laryngospasm, tracheal collapse, etc. These instruments should be instantly available during the postoperative period and experience has shown that recovery from postoperative complications is in direct proportion to the speed with which they are met. The value of a recovery room is most significant during this time. Postoperative bleeding from the thyroid area must be combatted by immediately opening the wound and controlling the hemorrhage by clamp or packing. The airway may be compressed by the accumulated blood and this may be treated by either tracheotomy or the insertion of an endotracheal tube under topical anesthesia if necessary and if time permits. Paralysis of a vocal cord due to injury of, or trauma to, the recurrent laryngeal nerve may result in the inability of the patient to draw air past the paralyzed cord that lies unmoving in the air passage. If this is bilateral, it may be quickly fatal unless tracheotomy is performed in time to prevent anoxia. If unilateral, the insertion of an endotracheal tube if the depth of general anesthesia permits or under topical anesthesia, either per oram or per nasum, may overcome the partial obstruction pending the recovery of the function of the nerve. In unilateral cord paralysis tracheotomy is seldom necessary if the patient is conscious because the accessory muscles of respiration compensate, more or less, for the decreased size of the airway. If unconscious, tracheotomy usually is necessary as a precaution against anoxia. However, a rubber tube (Magil) lubricated with an anesthetic ointment, may be passed through the nose and into the trachea. This may suffice for an airway pending the return of the patient to consciousness. Pulmonary atelectasis is a frequent complication of thyroidectomy. The obstructing mucus in the tracheal tree must be removed in order to overcome the collapsed portion of the lung that lies below the mucus plug. This may be accomplished in many ways and the more simple methods should be tried first. If the patient can be made to cough, the plug may be dislodged. By passing a lubricated catheter through the nose and into the trachea, suction may be employed through this catheter to remove the mucus and, incidentally, stimulate coughing. By vigorously clapping the patient on the back while he lies with the affected side uppermost and the head lowered in Trendelenburg position, there may be some mechanical result in dislodging the plug. These efforts failing, bronchoscopy should be employed. By this latter method the plug can be located by direct vision and removed. However, although the patient presents a clinical picture of atelectasis, namely, pain in the chest, hyperpnea and dyspnea in addition

to cyanosis, the bronchoscopist should await the roentgenologic evidence of atelectasis before proceeding in order to avoid doing bronchoscopy unnecessarily.[23]

INTRATHORACIC GOITER

Thyroid enlargement may reach such dimensions as to extend downward to the superior mediastinum. Conditions presented by such a growth affect the anesthetic management of thyroidectomy greatly. The enlarged gland causes pressure on the trachea, either from the right or left, and the trachea usually is pushed to the side opposite to the location of the enlarged lobe, although occasionally it may be displaced to the same side. This produces tracheal deviation. Preoperative roentgenogram is essential in determining the direction of the deviation. Occasionally, the position of the patient determines the stress upon the trachea. It may reach such great size and weight that the patient is unable to lie down to rest but must always remain in the upright position otherwise tracheal obstruction results. Under this condition it is essential that an endotracheal tube be in place before surgery is begun. The tube may be introduced under topical anesthesia with the patient in the upright position using indirect laryngoscopy. After the introduction of the tube the patient is able to lie down without producing tracheal obstruction. A case is recalled in which the patient was anesthetized in the upright position and when the laryngeal reflexes were abolished, was swiftly lowered to the supine position and an endotracheal tube inserted before any sign of anoxia developed. Pushing the tube forward past the larynx, the anesthesiologist was able to feel the enlarged thyroid being lifted off the trachea wall. The breathing which had been completely obstructed for a second or two by the weight of the thyroid now became free and easy and the operation proceeded. This was accomplished in an unhurried manner. After the goiter had been completely removed and before the neck muscles were sutured, the endotracheal tube was removed and the breathing of the patient was observed to be unobstructed. This obviated the necessity of a tracheotomy and the neck muscles and skin were sutured following which the patient was able to sleep in any position and made an uneventful recovery.

SUMMARY AND CONCLUSION

Woodbridge[4] has written, "It may be said that the skill of the anesthetist is the most important factor in the determination of the anesthetic risk." This most certainly applies to the patient undergoing operation for thyroid disease.

The physiology and pharmacology of the thyroid gland are discussed. The methods employed in thyroid anesthesia and some of the dangers and accidents that may occur are presented. Suggestions are made regarding pre- and postoperative treatment of thyrotoxicosis and methods of combatting accidents before, during and after operation.

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Correction: In the article by Drs. Tamerin, Metzger and Wright appearing on pages 325 to 330, the September 1953 issue of the Journal, errors in bacteriologic nomenclature occurred. In the table on page 327 and in the text of the article, the following organisms are referred to: Bacillus sporogenes, Proteus sporogenes, Pseudomonas sporogenes, Neisseria sporogenes and Clostridium sporogenes. The correct terminology should have been Bacillus sp., Proteus sp., Clostridium sp., etc., the "sp." being a commonly used designation to denote that the particular species was not determined.

THE SPONTANEOUS INVOLUTION OF CUTANEOUS VASCULAR TUMORS

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IN the absence of any form of active or visible therapy, the spontaneous disappearance of a solid mass protruding from the cutaneous surface is a mysterious phenomenon.

A wart, which is a solid tumor having for its diagnostic characteristic the "vascular" seeds, may vanish in a few days. This has been discussed by Zwick,[1] and Sulzberger and Wolf.[2]

A cavernous hemangioma may take two or three years to disappear and its gradual involution be more difficult to follow because the patient may be lost from sight or have placed himself under the care of an unbeliever in expectant therapy. Since the complete and spontaneous disappearance of hemangiomas is more difficult to prove than that of a wart, there is a general trend of incredulity or of negation expressed by ignoring the subject completely.

A valuable investigation of the matter was done by Traub[3] in 1933, "in view of the obvious confusion existing in the minds of most physicians in regard to the proper disposition of cases of vascular nevi." Traub submitted a questionnaire to leading pediatricians and dermatologists and found that of about ninety answers less than 10 per cent "had observed the spontaneous disappearance of a nevus simplex, a nevus flammeus, a nevus araneous, a hemangioma or a cavernous angioma in more than a very few instances." About 63 per cent "had observed such a disappearance *rarely* (one or two cases), and 27 per cent had never noted a spontaneous cure during their entire period of practice."

Traub quotes the following statement of Howard Fox in regard to cavernous hemangiomas: "Personally I have never followed such lesions during the course of years and actually seen them disappear. I feel sure that many of them disappear spontaneously (possibly due to trauma) for the following two reasons: Hemangiomas are relatively common in infants, but extremely rare in my experience in adults. Some of these are treated by physicians, but there must be many which never receive medical treatment. As we do not see them in adult life, the conclusion seems justified that they may disappear spontaneously." The same opinion is voiced by Mackee and Hopkins in the discussion of a case presented by Hopkins.[4]

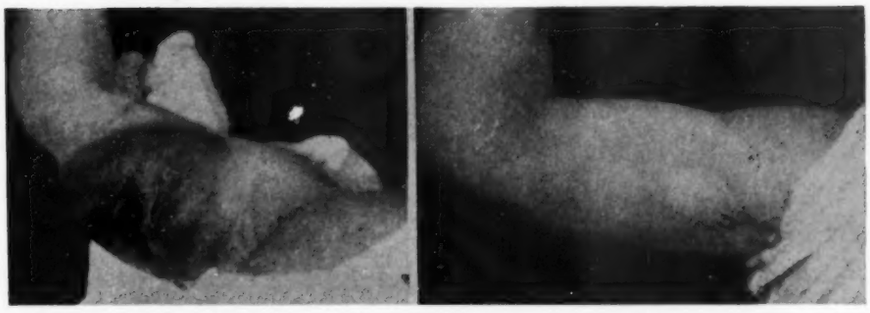
Many and various opinions were gathered by Traub from the literature before reaching his conclusions that: "hemangiomata and cavernous angiomata have been definitely observed to disappear spontaneously in a number of cases . . . but this happens with *such relative infrequency* that it seems advisable to commence the treatment during the first year of life." Traub repeats his statements in the discussion of Hopkins' case[4] and Andrews' paper.[5]

Blaisdell[6] says "that spontaneous resolution frequently occurs in the nevi of the elevated type . . . some go so far as to state that practically all will disappear during the early years of childhood . . . this phenomenon is entirely contrary to my own experience." In the discussion of Blaisdell's paper in regard to large nevi of the cavernous type Oliver says: "I have followed many that had no treatment whatsoever . . . many of them disappeared without a trace. It is my strong belief that this type of nevus is almost never seen in adults," and Oliver repeats this statement in his discussion of Andrews' paper.[5]

Costello[7] also states that "the number of instances in which spontaneous involution of cavernous hemangiomas occurs is *relatively small.*"

On the contrary, Sulzberger and Wolf[8] state: "Fortunately, most hemangiomas of the cavernous type 'heal' spontaneously with or without ulceration . . . the regressive changes often appear first in the center . . . all traces of color have usually disappeared by the fifth year. . . . Since this is the usual course without treatment, drastic measures . . . are often

* Read at the Tenth International Congress of Dermatology, London, England, July 21, 1952. A discussion of this article will appear in the author's reprints.



1A 1B

FIG. 1. A, spontaneous regression of cavernous hemangioma of arm; one month old child with bulky, bluish, compressible hemangioma measuring 6 by 6 by 3 cm. in the skin of the arm; B, result eighteen months later following spontaneous regression without treatment of any kind. (From: WATSON, W. L. and MCCARTHY, W. D. Blood and lymph vessel tumors. *Surg., Gynec. & Obst.*, 71: 569, 1940.)[17]

inadvisable, and treatment should generally be expectant and conservative."

Becker and Obermayer[9] have said, "spontaneous regression is common in this type of hemangioma (strawberry) and often completed by the first year (Lister). Hemangioma cavernosum grows slowly and shows little tendency to spontaneous regression." The opinion of Mitchell-Heggs[10] is: "In the great majority of cases (of strawberry) they grow rapidly during the first year or so, then cease to increase in size and disappear spontaneously before the end of the fifth year without leaving any trace (Lister 1938)." Crawford[11] reporting on 190 hemangiomas treated with sclerosing solution says that "a large majority will spontaneously involute."

The hemangioma reported by Bechet in discussing Hopkins[4] and Andrews[5] cases is remarkable: "I observed some years ago a child with a large greatly raised angioma involving the eye and extending from the infraorbital region to the hairline on the forehead. The eye was completely closed, and pus exuded from it. About an inch (2.5 cm.) above the eye was an ulcerated area which, according to the father, bled freely whenever the child cried. It had been present for only a week. I gave the father a prescription for boric acid ointment, as a placebo, to be used until I could get a report from an ophthalmologist as to the condition of the eye. The patient did not return. Some years later the boy came to the office for the relief of neurodermatitis of the cubital fossae and popliteal spaces. The enormous angioma had entirely disappeared, leaving a perfectly smooth superficially atrophic area, and the eye was normal. The cosmetic result was excellent. To my intense surprise the father stated that the ulcer on the lesion had increased in size for a week and that subsequent to some sloughing the lesion rapidly disappeared. He ascribed this miraculous result to the boric acid ointment I had prescribed."

In a discussion following a case presentation[12] Parkhurst states: "It is my impression that practically all cavernous hemangiomas disappear spontaneously sooner or later"; while Cole, calling attention to the difficulty "to predict which one is going to disappear and which one is going to stay" advises that all be treated as early as possible.

Most outspoken against any form of therapy are Lister[15] and Anderson.[16] Many authors discussing management of infantile hemangiomas, after a brief mention of spontaneous involution, report occasional cases which remained untreated (not on the authors' advice) and note that the hemangiomas have vanished without treatment. Watson and McCarthy[17] report three such cases. (Fig. 1.) Rambar[18] reports four cases after the age of six months. Crawford[11] lists eleven cases. Hopkins[4] and Bechet each reported one case; Sweitzer, in discussing Andrews'[5] paper added one case; Bowers[13] in reviewing the result of thorium X in forty-four cases says that he received the impression that thirteen among them regressed spontaneously. Delario[19] reported facial hemangiomas which he treated with radiation. On the patient's return for routine check-up, he was surprised to see that back and buttock hemangiomas, which were left untreated, had vanished. He speculates on the possibility that ionization effects were carried to a distant place and says: "This simultaneous disappearance of irradiated and

2A 2B 2C

3

4A 4B 5A 5B

FIG. 2. A kind of hemangioma difficult to see involuting spontaneously because everybody agrees that one application of CO_2 will take care of it. Active therapy is indicated in a case like this. However, cooperative parents agreed to let the hemangioma go untreated. A, in infancy; B, at first visit to me at the age of two; C, at second visit at the age of five.

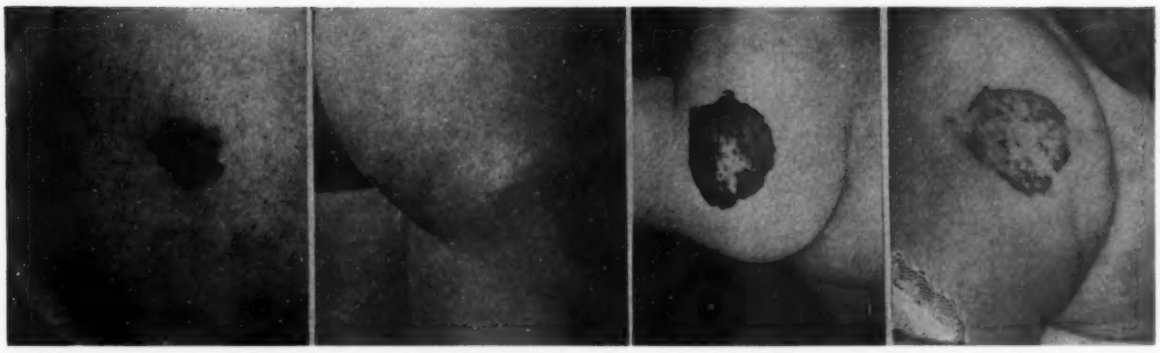
FIG. 3. Vulvar hemangioma in 1943, 1944 and 1945, respectively. No therapy was instituted. From information received in 1948 there was no trace of it at that time.

FIG. 4. Cavernous hemangioma. A, at six months of age; B, at six years; no therapy.

FIG. 5. A, infantile anal hemangiokeratoma; B, the same patient at twenty years of age; no therapy.

non-irradiated lesions occurs often enough so that we now treat body lesions first with the hope that the face lesions will disappear without treatment."

In 1946 I reviewed 247 cases of infantile hemangioma.[20] I had no opinion at that time on the *favorable to expectant therapy* statements of Lister and Anderson because I had had no personal experience with it. Practically all private and hospital patients received treatment in one form or another. Re-examination after years of the very few untreated infants was, and is,



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8

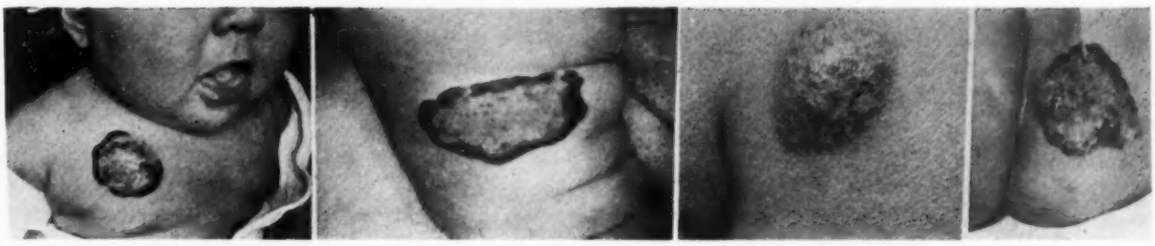

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FIG. 6. Result of expectant therapy. A, in 1944; B, in 1951. Noticeable scar is due to rupture and secondary infection (usually of no importance); contributory factor to the involution of hemangioma.

FIG. 7. A, at age of eleven months; B, at age of four years; no treatment.

FIG. 8. Hemangiomas which disappeared spontaneously between the ages of three and five.

FIG. 9. Former cavernous hemangiomas on their way to spontaneous involution.

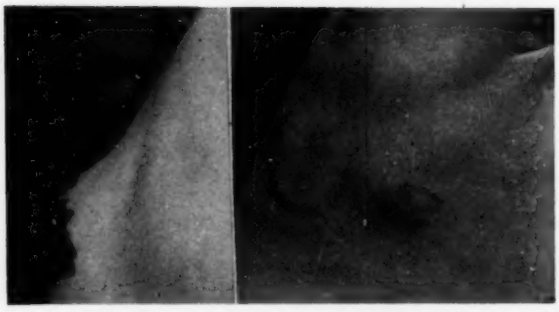
difficult and often impossible. Since 1946 I have made a special effort to get information and have tried to locate and re-examine untreated patients.

The port-wine mark (nevus flammeus) is generally considered recalcitrant to common therapy and there are very few claims of therapeutic success (thorium X-grenz rays). Consequently this is one of the varieties offering a good opportunity in which to observe spontaneous involution. I can offer no figures but I think the number of cases seen in infancy is noticeable compared with the few seen in adult life. The involution varies from a very faint pink discoloration to a complete disappearance.

The strawberry and cavernous types are the vascular nevi most common and most objectionable if located in exposed parts and for which parental objection to expectant therapy is most vociferous.

In my experience the dangers of bleeding and secondary infection pointed out by many writers in favor of active therapy are negligible. In over thirty years I have never seen any serious complication in infantile hemangiomas *of the kind and size usually coming to the dermatologist's attention.*

Since 1946 I have found proof of spontaneous disappearance, either complete or cosmetically satisfactory, by having seen the patient before



10A 10B

FIG. 10. A combination of strawberry (superficial) and cavernous (deep subcutaneous) hemangioma midway between armpit and wasitline at right side. The location would be an easy procedure for the surgeon and equally easy for surface radium, radium needles, radon implants, sclerosing injections, but not for CO_2. Because it could be easily covered, even by a two-piece bathing suit, and easily removable later if spontaneous disappearance failed to materialize, it was left untreated. A, hemangioma at age of five months; B, at age of four years.

FIG. 11. Satisfactory scar remnant of a spontaneously involuted hemangioma of lip in a now sixteen year old girl.

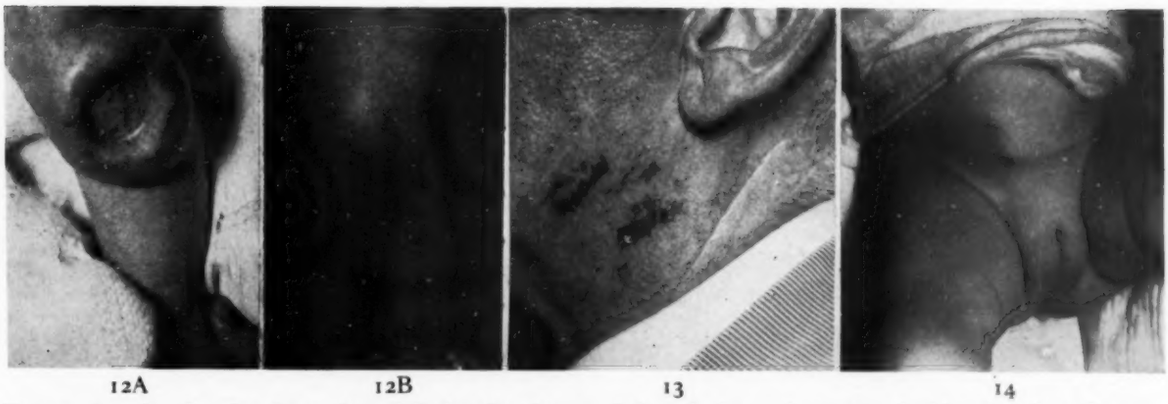
and after or by being reliably informed of the development of the case by family and friends. Those followed up were fifty-two patients (almost all having strawberry and cavernous hemangiomas) among ninety-five from the Department of Dermatology and Tumor Clinic of the Rhode Island Hospital and 332 patients seen in my office during the last ten years. Of these 427 cases, 245 received either carbon dioxide or radium treatment. Some of those which involuted spontaneously are illustrated in Figures 2–11, 12 and 14. In the last five years I have left untreated fifty-nine of my private cases and have sent out fifty-nine letters to learn about the result. I have had answers by letter or otherwise from thirty-three; twenty-four said that the birthmark had disappeared completely or that the remnants were cosmetically satisfactory; four said that the birthmark did not change (some of them had been seen only one or two years previously); five had been treated by surgery or radiations.

I have no personal experience with stellar nevi but I recall numerous patients telling me of having them and later seeing them no more. Bean[21] in his 331 page monograph, in regard to stellar nevi in pregnancy, quotes many authors and states repeatedly that disappearance of stellar nevi and palmar erythema soon after delivery is a matter of common knowledge.

Among miscellaneous vascular disorders of undetermined nature, I wish to report three cases. Illustrated in Figure 12 is a doughy, doughnut-shaped, flesh-colored tumor below the knee of a two weeks old male infant. Because of the location, age and uncertain diagnosis, it was decided to sit and wait. Six months later the tumor, 5 by 5 cm. in diameter and 1½ cm. thick, had vanished leaving only a slightly wrinkled surface. The second case is that of a seventy-five year old healthy business executive. (Fig. 13.) It can be tentatively labeled as "spontaneously developing and spontaneously involuting telangectases" which appeared several times in the same area of his left cheek and lasted only a few days. This occurred several times over a period of months, was symptomless and there was no clue as to the etiology. The third case is in a female, sixteen days old, with a rubbery, blue-green patch on her right lower abdominal quadrant. Because of its consistency it suggested fat necrosis of the newborn and hemangioma. (Fig. 14.) Such a conspicuous vascular fatty disorder involuted after six months.

The mechanism of spontaneous involution is obscure. The best explanation offered is that of a sudden severance of blood supply, as is thought to be the cause of the dropping of hair in alopecia areata, perhaps due to obliteration of the supplying vessels by thrombosis.

It is my belief that spontaneous involution of vascular tumors is a frequent occurrence although figures, percentages and photographic



12A 12B 13 14

FIG. 12. A, a doughy, doughnut-shaped, flesh-colored tumor below the knee of a two week old male infant. Because of the location, age and deferred diagnosis expectant therapy was decided upon. Six months later the tumor was completely gone, leaving only a slightly wrinkled surface; B, the infant's leg at eighteen months of age.

FIG. 13. Spontaneous, non-traumatic, neurogenic (?) vascular disorder, "spontaneously developing and spontaneously involuting telangectases," in a fixed area, recurring in a herpes simplex manner, involuting in a few days without leaving a trace (no bruise discoloration). This should be an example of so-called "stigmatization."

FIG. 14. Hemangioma and/or subcutaneous fat necrosis of the newborn or hemangioma simulating fat necrosis of the newborn. The photograph taken at the age of six weeks shows the discoloration and deep shadow demonstrating subcutaneous circulating blood. No trace was visible of the vascular disorder at the age of six months. (See: RONCHESE, F. Infra-red photography in the diagnosis of vascular tumors. *Am. J. Surg.*, 37: 475, 1937; *Arch. Phys. Therapy*, 20: 354, 1939.)

documentation before and after are difficult to gather. All the cases I have seen were cosmetically very satisfactory. The problem deserves better than a "maybe" or an "occasional" qualification. I have no recollection of a case in which spontaneous rupture has caused serious hemorrhage or infection. It seems to me complications would occur more often with freezing and sclerosing therapy so frequently used. Consequently advice against expectant therapy seems to me unwarranted. I believe it is to be seriously considered in arriving at a decision on what to do in a given case. To reach a general agreement, however, seems a most difficult matter. In a given case of hemangioma in which *there was agreement* among dermatologists that radium *was* the indicated form of treatment, there were not two men who had the same idea on *how* the radium should be administered. Another sad fact is that hemangiomas are considered to belong to the surgeon, radiologist, dermatologist, pediatrician or general practitioner, respectively. Mutual consulting advice is seldom asked or received. (Figs. 15 to 21.)

One may read authoritative statements opposing unconditionally the use of radium in hemangiomas, while there are cases in which radium is the best remedy available, and it has been proved by many observations of patients treated years ago that most of the unfortunate sequelae credited to radium are due only to its improper use.[23] The same applies for expectant therapy. Each case is different and needs evaluation of all the therapeutic possibilities, radium and expectant therapy included.

SUMMARY

For the last five years several cases of vascular tumors (mainly infantile strawberry and cavernous hemangiomas) which had vanished without therapy were observed and the literature on the subject perused. It is difficult to form an exact idea of the percentage of such occurrences because of the prevailing opinion, especially among radiologists and surgeons, that it is unwise or dangerous to leave hemangiomas untreated. There is also parental unwillingness to wait for three or four years for spontaneous involution. Consequently, the great majority of such patients receive treatment in one form or another. To repeat Traub's words of nineteen years ago, "the obvious confusion existing in the minds of most physicians in regard to the proper disposition of vascular nevi" is still with us.

I do not advocate expectant therapy for all cases; however, being convinced that a large majority do involute spontaneously, I am in favor of no therapy in selected cases in which the lesions are located in covered body areas

15A

15B

16A 16B

FIG. 15. A and B, examples of hemangiomas in which expectant therapy is indicated. Even the scantiest bathing suit will cover some of them. These cases can be handled easily by surgery should spontaneous involution fail to materialize.

FIG. 16. A, scrotal hemangioma in an infant; this could be left alone or removed surgically later in life if so desired; B, the same for the case of hemangioma of the lip.

or may be easily removed surgically at a later date in the event spontaneous involution does not materialize. Treatment usually is indicated in exposed parts if the hemangioma is small because there are easy, quick and safe methods, or if it is large because it may be "the exceptional one" which will not vanish and later therapy will be more difficult.

As with the use of radium, I believe expectant therapy has its place and should be given due consideration.

Addendum: In a recent paper Brain and Calnan[24] reported as follows: "It has long been known that most of the cavernous and mixed

17A 17B

18

FIG. 17. A and B, the arteriovenous (pulsating) hemangiomas for which the only treatment of choice is surgery. Unless pathologically proved otherwise, only this type of hemangioma deserves to be called "arterial."

FIG. 18. These hemangiomas should represent a problem even to the skilled plastic surgeon. Sclerosing injections and CO_2 are not indicated. In the author's opinion, radiation is the treatment of choice.

naevi disappear spontaneously in childhood and that they are met with extremely rarely in adults. There is therefore no indication to treat such naevi when they occur in the scalp or on parts of the body which are usually hidden by clothing." Brain and Calnan reviewed 614 cases of which 295 received radium, 98 x-rays, 74 radium and x-rays and 147 no treatment. In regard to this last group they write: "the ultimate results were equally satisfactory."

Duperrat, in his excellent monograph[25] says: "Involution may be total, terminating with the

19A 19B

20A 20B

FIG. 19. A, a case in which not all methods are indicated. CO_2 and surgery are not advisable. Sclerosing injections or radiation can be employed. In 1944 three 0.25 radon implants were used. B, photograph taken in 1948 showing result. Remnants of hemangioma are easily eliminated by electrocoagulation. The scar is satisfactory, with no evidence of bone or eye damage to date. This is an office procedure requiring no anesthesia and no assistance which is evidently highly preferable to hospitalization and plastic repair.

FIG. 20. A, one of the hemangiomas which failed to disappear and was carried to adulthood. It was electrocoagulated in the office, taking only a few seconds. The result is a satisfactory scar (B).

disappearance of the angioma." The fact is far from exceptional. He quotes eight cases of spontaneous involution from the literature. Interesting also is the paper by Touraine and Duperrat.[26]

Dr. Van Gelder kindly informs me of an interesting graduation thesis presented before the Faculty of Medicine of the University of Amsterdam, November 20, 1952, by Dr. G. Van der Werf. With the cooperation of school physicians and general practitioners, sixty patients were examined with remnants of spontaneously involuted strawberry marks and 266 who had received various forms of treatment. The untreated cases were classified according to cosmetic criteria into three groups; satisfactory forty-six, moderately satisfactory twelve, unsightly one. This last one had disappeared after three years, an example of late involution. Dr. Van der Werf confirms the opinion of Lister.[15] Of sixty-eight treated strawberry marks (by cauterization), twenty-four were satisfactory, thirty-four moderately satisfactory and ten unsightly. Of sixty-two treated by radiation fifteen were satisfactory, twenty-five moderately satisfactory and twenty-two unsightly. Of 136 treated surgically, thirty were satisfactory, fifty-six moderately satisfactory and fifty unsightly.

Although the matter of profit or fee should have no place in the decision concerning treatment of hemangiomas, the statement made by British physicians is apropos. They stated that because of socialized medicine, the vast amount of work required, and the disinclination to do additional work without increase of pay resulted in non-treatment of infantile hemangiomas which nevertheless all disappeared. Ap-

21A 21B 21C 21D

FIG. 21. This typical case of spontaneous involution is shown to demonstrate the difficulty of following up a case to prove it. A and C, cavernous hemangiomas on the shoulder and the flank in a two month old boy. The parents were willing to cooperate with the no-therapy project for the flank hemangioma but not for that on the shoulder. The latter received 175 millicurie hours for seven hours, 1 cm. from skin, in two exposures, October 23 and December 18, 1946. Carbon dioxide snow was used once on May 5, 1947. In December, 1947, the family moved to Europe. They were directed to a dermatologist there but never went or answered my inquiry. The case was considered lost. On December 30, 1952, the patient reappeared because of the mother's need of dermatologic care. B and D, show how the hemangiomas look at six years and four months of age. The remnants of the treated and non-treated hemangiomas are practically alike. The amount of radiation employed is obviously small and the involution of the shoulder hemangioma may be considered as 90 per cent spontaneous.

parently this is one of the better aspects of socialized medicine.

Not much has been added to the subject in two recent papers.[27,28]

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Recent studies of five-year cures show that simple thymectomy is very helpful in patients with myasthenia gravis, especially when this operation is performed in early cases exhibiting an enlarged thymus gland. Ross reviewed 100 cases in which benign thymomas had been surgically extirpated and found that in almost 90 per cent of them marked or moderate clinical improvement was manifest and that these patients often required greatly reduced doses of neostigmine as compared with their daily preoperative requirements. Patients treated conservatively alone are apt to present a much greater morbidity, greater disability, poorer progress and a higher mortality. (*Richard A. Leonardo, M.D.*)

TREATMENT OF CANCER OF THE FLOOR OF MOUTH AND TONGUE*

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ON reviewing medical literature describing treatment of cancer of the floor of the mouth and tongue we find many differences as to the recommended therapy. There are numerous varied methods of treatment, each with its proponents. The Tumor Clinic is staffed by pathologists, radiologists, oncologists and surgeons, and these together decide the appropriate correlation of surgery and/or radiation therapy. We have analyzed our results with the aim of determining the best pattern of therapy according to the location and extent of each lesion.

Over a third of the patients with cancer of the floor of the mouth and the tongue treated at the Veterans Administration Hospital, Atlanta, Georgia, from 1936 to 1950 are now without evidence of disease. Follow-ups have been 100 per cent. Many patients who have not been cured have received appreciable palliation, which has resulted in their added comfort and extension of life for several years.

For purposes of analysis the cases presented will be divided into anatomic sites involved by the tumor: (1) floor of the mouth, (2) anterior two-thirds of the tongue and (3) base (posterior third) of the tongue. Such a division is indicated by the pathologic condition encountered and by the mode of treatment which can be used. Lesions of the floor of the mouth appear to have the lowest grade of malignancy. The first metastases from this area are usually found submentally, and extension into the mandible is frequent. When the primary tumor is in the anterior two-thirds of the tongue, the grade of malignancy is, as a rule, higher. Such tumors metastasize frequently to the carotid areas, as well as the submaxillary areas. If the carcinoma originates in the base of the tongue, it will in all probability be still more active. Extensive neck metastases frequently occur from cancers in the base of the tongue because of the rapidity of growth and the late recognition of the primary tumor.

PLAN OF TREATMENT

Recognition of the primary tumor, including biopsy and definition, is necessary before assessing the treatment and recovery possibilities.

FIG. 1. Specimen of *en bloc* excision for cancer of the tongue and floor of the mouth, which was attached to the mandible and had metastases in the right side of the neck.

The presence, location and extent of metastases then assume importance. There are a few late cases in which no treatment can help.

The first aim of therapy should be to control the primary lesion. We believe that the intact lymphatic pathways serve as a temporary trap for metastases during or shortly after the completion of the therapy given the oral disease. Early eradication of the secondary spread precludes the control of later metastases from a persistant primary.

The oral cancer may be best destroyed in some cases by irradiation, in others by excision

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FIG. 2. Same patient as Figure 1 two years after surgery. There is a superficial recurrence in the right side of the neck. This has been excised and treated with x-ray therapy. There is no obvious disease in this patient at the present time.

FIG. 3. Bilateral radical neck dissection together with *en bloc* excision of the anterior third of the mandible and floor of the mouth has just been completed. The soft tissue of the chin is being held up to allow a view of the oral cavity through the neck incision.

or cautery destruction. Certain lesions are best controlled by *en bloc* excision of the oral carcinoma and its regional lymphatics, as advocated by Carroll.[4] (Figs. 1 and 2.) For patients whose primary tumor is uncontrollable or who have grossly inoperable metastatic lesions, radon seeds in addition to x-ray therapy and radium have been of some value when used for the primary site and/or for the metastases.

Patients are given oral hygiene prior to x-ray therapy. In order to diminish radiation osteomyelitis teeth that are not intimately associated with the tumor are usually removed previous to the use of x-ray.

Since the curability of metastatic nodes by irradiation is extremely low, they should, if possible, be surgically removed. It has not been our policy to perform routine or so-called prophylactic neck dissections.[3] This policy is substantiated by the fact that ten of our thirty-one successfully treated patients followed over two years have never had any surgery. We have had other patients who have had neck dissections for palpable nodes where a careful histologic search for metastatic disease in the specimens has been negative. When persistent adenopathy is palpable in the neck, however, a neck dissection is definitely recommended.

If the oral disease is treated as a separate entity, the neck is carefully evaluated at frequent follow-up examinations. Palpable nodes are removed by *en bloc* excision of the neck contents. Occasionally for high, anteriorly located metastases either a single or bilateral upper neck dissection is done. In this case everything above the hyoid bone and anterior to the posterior belly of the digastric muscle is removed. This includes the submaxillary gland and the anterior digastric belly.

As a rule, however, if there is neck disease, it is thought best to do a complete radical neck dissection, including the sternocleidomastoid muscle and the internal jugular vein. Unless there is very minimal neck disease, the spinal accessory nerve is sacrificed. When disease is superficial, the platysma muscle is left on the specimen instead of on the skin flaps.

We have experienced several episodes of skin slough overlying the carotid artery (especially in postirradiated patients), resulting in erosion of the artery and severe hemorrhage. One of these patients died shortly thereafter from thrombosis of the internal carotid artery. Accordingly, we have developed a policy of covering the carotid with a muscle flap. The levator scapulae, posterior scalenus or strap

4A 4B

FIG. 4. Same case as Figure 3. A, three weeks postoperatively. There is only moderate edema of the right side of the face after removal of both deep jugulars. The right external jugular was preserved. The contour of the chin has been preserved by use of a Kirschner wire imbedded into each cut end of the mandible. Anterior third of the mandible was removed. Note the break down of the skin near the incision, which has been placed well away from the carotid artery. B, eight months postoperatively. The wound has healed completely and there is no noticeable edema of the face. The contour of the skin is good. There is no evidence of disease.

5 6

FIG. 5. Epidermoid carcinoma of the lateral and inferior surface of the tongue.

FIG. 6. Same case as Figure 5 after treatment by x-ray therapy through intra-oral and submaxillary ports. There has been no evidence of recurrence or metastases in over two years since completion of therapy.

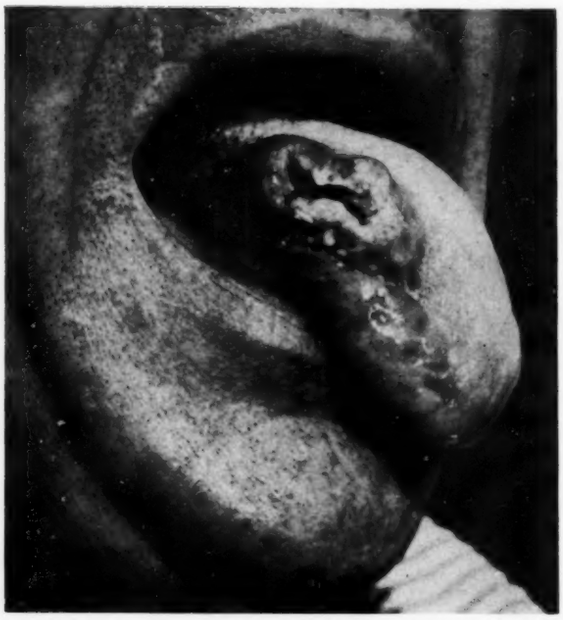

FIG. 7. Papillary infiltrating ulcerated cancer of the tongue, middle third. This was treated by x-ray through intra-oral and submental ports. All disease was apparently controlled, when the patient died from a coronary occlusion eight months after completion of treatment.

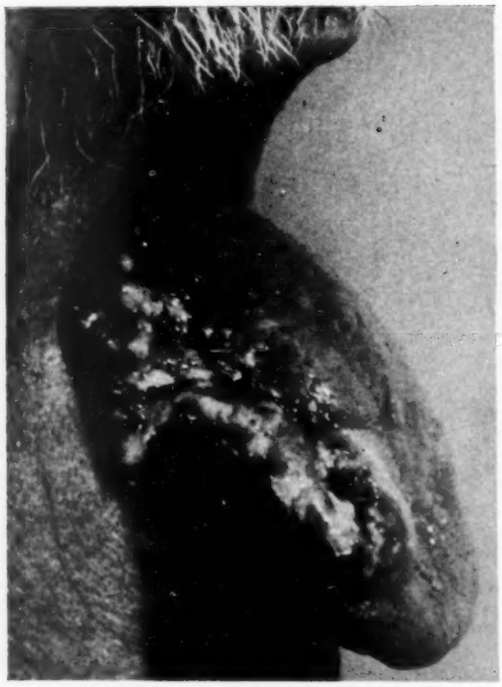

FIG. 8. Extensive carcinoma of the tongue, primary controlled by total glossectomy. Neck disease, however, recurred after radical dissection. This patient died eleven months after glossectomy.

muscles may be sufficiently mobilized for this purpose. In addition, the vertical portion of the neck incision is carefully placed as far anteriorly or posteriorly as possible in order to minimize the skin slough overlying the vessels. After these measures we have had no further bleeding in spite of several skin sloughs.

Various combinations of neck dissections are done according to the extent of metastatic disease. We have recently successfully completed a bilateral radical neck dissection with *en bloc* removal of both jugular veins, the contents of both sides of the neck, both submaxillary areas, the anterior half of the mandible, the floor of the mouth and a portion of the tongue. The patient has made a complete recovery from his operation. (Figs. 3 and 4.)

Carcinoma of Floor of the Mouth. Superficial lesions not invading the tongue or the mandible are usually treated by irradiation, usually external, plus intraoral x-ray therapy or a radium mold. Because a tumor invading bone is not controlled by irradiation, those with minimal invasion of or attachment to the mandible are destroyed by the cautery. Coagulated bone should be removed at the time of operation. Lesions which moderately invade the tongue are usually treated by the combination of internal and external irradiation. Implantation with radon seeds or cautery excision may be necessary for residual disease. Advanced lesions (with fixation of the floor of the mouth, extensive attachment to or invasion of the mandible, or deep invasion of the tongue) require radical excision. A combined cervical and oral approach allows removal of the tissue *en bloc*, including the mandible and neck metastases. Recurrence after local therapy is treated by a radical surgical excision. Neck nodes are removed by neck dissections. These may be single or bilateral, upper or complete neck dissections. They may be ablated either after the primary is controlled or as a part of an *en bloc* excision.

Anterior Two-thirds of the Tongue. Tumor masses under 4 cm. in diameter that are noninfiltrative may be adequately treated either by intraoral x-ray therapy combined with external ports or by surgical excision. We have preferred irradiation, especially if it is easily accessible to an intraoral cone. (Figs. 5 to 7.) Cancerocidal effects from irradiation are difficult to obtain through external ports alone. Radium needles or radon seeds are occasionally necessary to provide adequate irradiation dosage.

FIG. 9. *En bloc* operation for cancer of the base of the tongue. The soft tissue incision has been inferiorly from the center of the lower lip to the hyoid bone and then laterally to the mastoid process. The right lower lip and chin have been reflected off the bone and are retracted laterally. The right side of the mandible has been transected just posterior to the mental foramen. The base of the tongue and right floor of the mouth containing the tumor have been cut free medially and remain attached to the right segment of mandible which will be removed with the right neck contents.

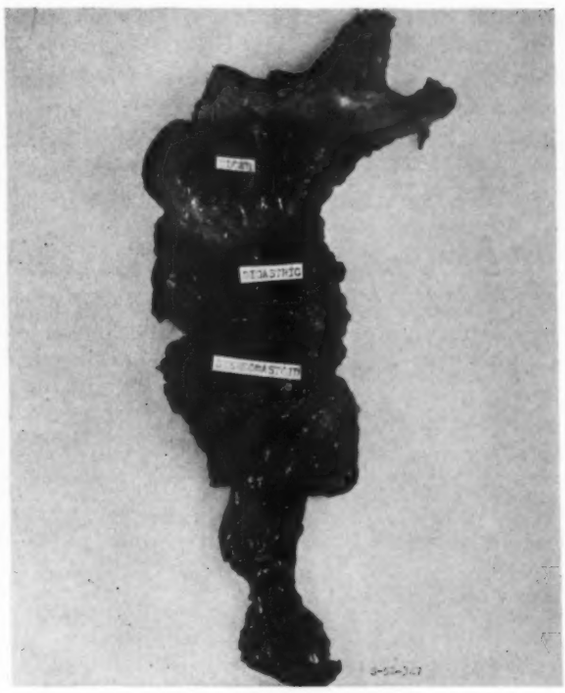

FIG. 10. Specimen from Figure 9.

Lesions over 4 cm. in diameter and those that are infiltrative are treated by surgical excision. (Fig. 8.) Even with total glossectomy the patient is able to swallow and to speak. When surgical excision is elected as the primary therapy of tongue lesions, neck dissection is done at the same time to remove all diseased tissue in continuity if possible. When indicated, we have not hesitated to sacrifice a portion of the mandible, either for exposure of the operative field or because of bone invasion or attachment. Neck dissections are for the most part complete on the side of the primary and, where indicated, suprahyoid dissections are carried out on the opposite side as well. Whenever extensive tongue surgery is done, and especially if combined with neck dissection, tracheotomy is a part of the procedure.

Metastatic neck nodes remaining or appearing after local therapy of the primary are treated by a neck dissection. If bilateral complete neck dissections are indicated, the side having the greater amount of disease is done first. After complete healing on this side (two to four weeks) the second side is done, if feasible, preserving the jugular vein at the second operation. We have had only recent experience with removing both jugular veins simultaneously, and this with success, as also reported by others.[2,3]

Base of the Tongue. Treatment of the primary lesion has been essentially by external x-ray therapy plus implantation with radon seeds for residual disease. In a few cases secondary cautery excision of the primary has been attempted. In most cases because the primary lesion was not controlled, neck nodes were treated by irradiation. A few patients have had their primary disease arrested sufficiently to indicate neck dissections for metastases.

In the past the prognosis of patients with these lesions has been found to be so poor that therapy was primarily directed toward palliation. Such patients were not considered to be amenable to radical surgery. Four patients with very extensive disease, considered unsuited for either irradiation or surgery have been treated in the past two years with nitrogen

mustard injected intermittently via polyethylene catheters inserted in the external carotid artery. In each case (after treatment from five to fourteen days) palliation was temporary. Only one of these patients is living (twenty-two months after treatment was begun) and he shows considerable disease.[5]

TABLE I*

Location	Total Cases	Number Alive with No Evidence of Disease at 2 Yr.	Per Cent Alive at 2 Yr. with No Evidence of Disease
Floor of mouth	33	14	42.4
Anterior two-thirds of tongue	32	14	43.7
Base (posterior third of tongue	18	3	16.7
Totals	83	31	37.3

* The figures were compiled for results of those patients followed for three years and there was no significant difference from the above results.

In those cases in which radical surgical excision was attempted following irradiation failure, the results have encouraged us to consider radical *en bloc* excision as a primary form of treatment. For this procedure a collar neck incision from the mastoid process is extended vertically in the midline to enter the mouth, splitting the chin, lower lip and mandible. Exposure is then very satisfactory for removing tongue and adjacent structures as far as necessary. Usually a large segment of mandible is excised with the primary lesion and the neck contents. (Figs. 9 and 10.)

RESULTS

In this hospital definitive treatment with a follow-up for two or more years has been given to eighty-three patients with cancer of the tongue and floor of the mouth. In addition during this period there were thirteen patients with far advanced disease who were given no definitive treatment, all of whom died a few weeks after admission. During the past two years eighteen other patients have been treated, seven of whom are apparently free of disease and several others are under treatment for residual disease or recurrence.

An analysis of the patients treated definitively and followed for two or three years is presented in Tables I, II and III. Table I gives the total number of patients treated and those alive at two years. Table II divides the patients into groups with and without metastatic nodes at time of admission and indicates the prognosis associated with metastases. Table III indicates the type of treatment given and the length of time each patient has been followed. The table also shows whether the patient had metastatic neck nodes at the time of admission and the significance of this finding. There were 44 per cent good results in the patients who had no evidence of neck metastasis at the time of admission, against 33 per cent good results in

TABLE II

Location	No Nodes on Admission					Nodes on Admission				
	Total	Alive and Well 2 Yr.	Alive with Disease 2 Yr.	Died without Disease after 2 Yr.	No Disease 2 Yr. or More (%)	Total	Alive and Well 2 Yr.	Alive with Disease 2 Yr.	Died without Disease 2 Yr.	No Disease 2 Yr. or More (%)
Floor of mouth	23	9	1	1	43	10	4	0	0	40
Anterior two-thirds of tongue	17	7	0	3	58.8	15	3	0	1	26.9
Base of tongue (posterior one-third	10	1	0	0	10	8	2	0	0	25

those who were thought to have metastases when first examined.

CONCLUSIONS

1. An analysis of the results of treatment of the cases of cancer of the tongue and floor of the mouth at the Veterans Administration Hospital, Atlanta, Georgia, shows that over one-third of eighty-three patients are now apparently free from disease from two to twelve years after treatment.

2. The methods of treatment have been either by irradiation, surgical excision or combinations of the two. The therapy for each case must be individualized. Generally speaking the primary lesion is controlled first and then metastatic disease is treated. Certain cases lend themselves to radical block excision of all disease as the initial treatment.

3. The various types of lesions have been classified and the form of treatment used for each type has been described.

TABLE III
FOLLOW-UP ON SURVIVALS
(Showing Method of Treatment)

	Years									
	2–3	3–4	4–5	5–6	6–7	7–8	9	10	11	12
I. Floor of mouth										
A. No nodes on admission										
(1) Free of disease										
X-ray therapy	1			1	1					
Surgery		1								
Combined x-ray therapy and surgery	1	1	1		1			1		
(2) Died without disease	1*									
B. Nodes on admission										
(1) Free of disease										
X-ray therapy					1					
Surgery	1									
Combined x-ray therapy and surgery	2									
II. Anterior two-thirds of tongue										
A. No nodes on admission										
(1) Free of disease										
X-ray therapy			1	2						
Surgery			1							1
Combined x-ray therapy and surgery				1					1	
(2) Died without disease	1†			1‡						
				1†						
B. Notes on admission										
(1) Free of disease										
X-ray therapy										
Surgery	1				1					
Combined x-ray therapy and surgery		1								
(2) Died without disease	1‡									
III. Posterior third of tongue										
A. No nodes on admission										
X-ray therapy					1					
Surgery										
Combined x-ray therapy and surgery										
B. Nodes on admission										
X-ray therapy			1							
Surgery										
Combined x-ray therapy and surgery			1							

* X-ray therapy
† Surgery and x-ray
‡ Surgery only

4. For cancer of the base of the tongue treatment by irradiation usually employed has been so unsuccessful that new methods of control were developed. Intermittent intra-arterial nitrogen mustard via the cannulated external carotid artery has been used recently[5] but has produced only a slight degree of palliation. We are now using radical *en bloc* surgical excision, in which the horizontal neck incision is extended into the mouth and an adequate surgical exposure is made by transection of or removal of the mandible.

5. Perseverance in follow-up and in maintaining an aggressive attitude toward residual or recurrent disease found after completion of the initial therapy frequently leads to eventual cure or prolonged palliation.

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CONTROL OF PAIN FROM RECTAL CARCINOMA WITHOUT SEDATION

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Brooklyn, New York

CHRONIC irritation has always been considered a definite etiologic factor in the production of cancer. Yet, pruritus ani is rarely if ever associated with cancer of the anal canal or perianal skin. It is mentioned only vaguely as a possibility in articles on pruritus ani. The incidence, if any, is certainly low. This is quite the opposite of what one would expect of an area constantly exposed to chronic irritation—sometimes for as long as twenty years.

It is a thought that has interested me though I fail to find discussion of it in the literature. My own investigation of the seeming contradiction has brought to light a few interesting points. One is related to decrease of pain and another to production of edema in cancerous tissues. It has required primarily some knowledge of the pathologic processes involved in pruritus ani.[1–3] Having seen clinical response to measures based upon certain theories concerning the etiology of pruritus ani, it was believed that an attempt might be made to reproduce pruritic phenomena in cancer of the rectum. In some small degree this has been done.

I have always believed that pruritus ani was the result of overstimulation of the parasympathetic nervous system. In this respect it is similar to many other conditions believed to be of neurasthenic or psychic origin. Increased peristalsis accompanied with slight relaxation of the anal sphincters occurs when there is stimulation of the parasympathetic nerve supply of the lower bowel. It has been said that capillary permeability may be influenced by variations in sympathetic nerve impulses.[4] This may explain the "weeping" of the tissues in the skin and in the base of the pruritic fissures. Excessive moisture, sometimes amounting to a considerable quantity of fluid, has been a well known characteristic of severe pruritus ani.

It may be assumed, for purposes of study, that increased capillary permeability is present in pruritus ani. I have taken certain steps to reproduce this condition in late cancer of the rectum. Parasympathetic stimulants were given to patients with inoperable carcinoma of the rectum or sigmoid. At first, pilocarpine or phystigmine were used, (Mrs. B. O., 1946) and it was believed that an increased discharge of fairly clear fluid resulted (from the carcinomatous tissues). It was not too difficult to distinguish between this fluid and the usual flow of heavy mucus and blood. The patient often volunteered the information and observations continued over a long period confirming the fact that there was an increased discharge of fluid from the tumor.

When newer and safer parasympathetic stimulants became available, they were used in place of pilocarpine. Urecholine was administered in a number of cases. In the very first instance a pronounced reaction was observed and repeatedly photographed. The patient (Miss M. McD.) who was fifty-five years old originally had cancer of the rectal ampulla. An actual cautery operation was done in August, 1947, and a perineal extirpation in November, 1947. This patient had always refused abdominal colostomy; and when a recurrence was found in October, 1949, she refused any further surgery. The recurrence appeared in the lowermost portion of the bowel that had been drawn down to the perineum. It was hard, nodular and palpable under the skin surrounding the lumen. The lumen quickly became smaller until stricture threatened to cause complete obstruction. (Fig. 1.)

At this stage urecholine, 15 mg., was given three times a day and some interesting observations were made. The carcinomatous tissue could be palpated beneath the skin more readily than in the rectum. (Fig. 2.) The hard nodular tissue continued to grow larger, spreading under the skin, but a change gradually took place. The mass became soft and edematous in many areas. There was no redness or pus formation. A bleb appeared pos-

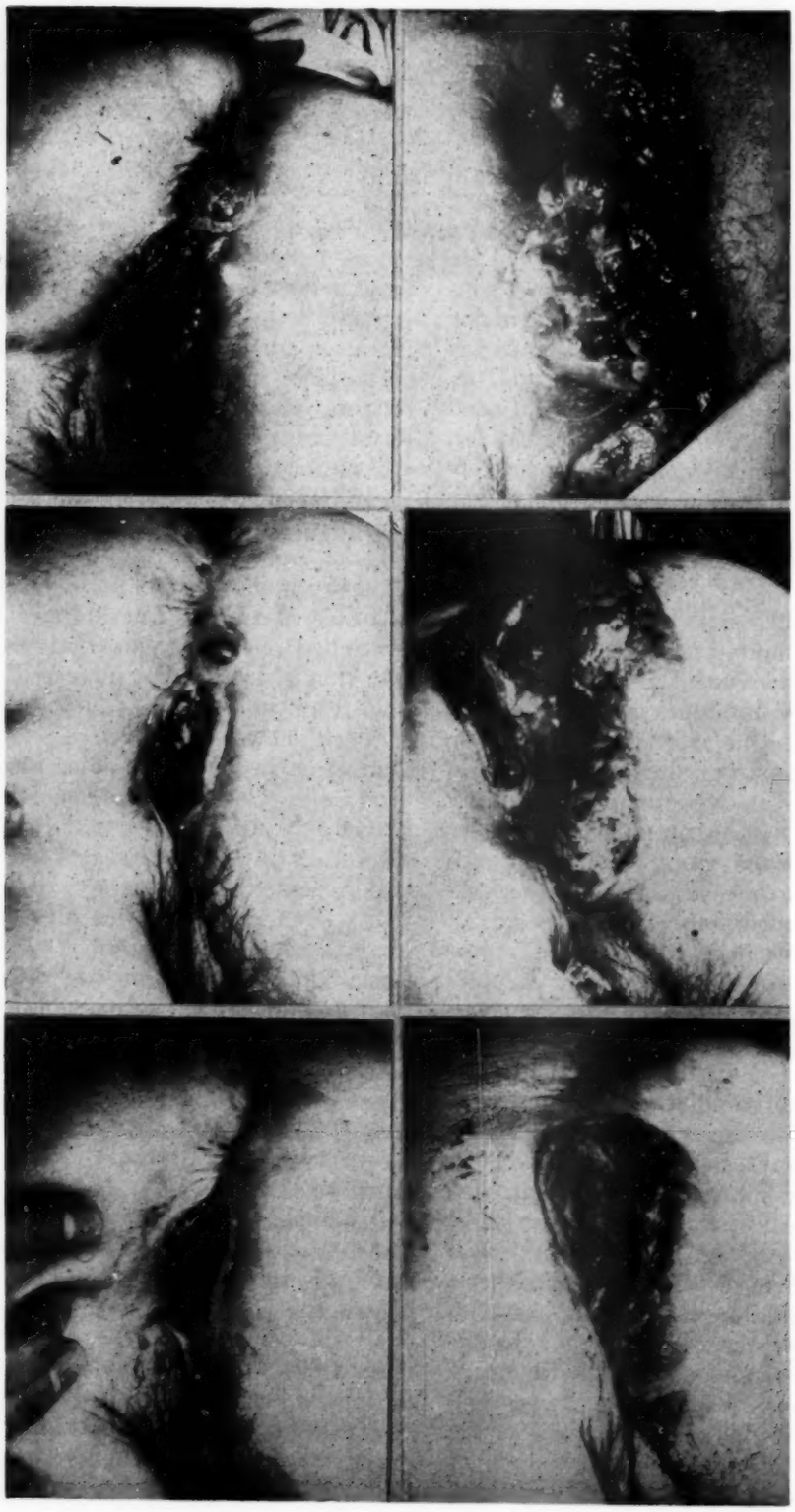

FIG. 1. Recurrent rectal carcinoma (McD.). FIG. 2. After urecholine administration, formation of bleb in skin over infiltrating carcinoma (McD.). FIG. 3. Enlargement of bleb or edematous area (McD.). FIG. 4. Emergence of edematous carcinomatous tissue (McD.). FIG. 5. Edematous carcinoma surrounding enlarged lumen (McD.). FIG. 6. Edematous fluid on surface of another case. (G. M.)

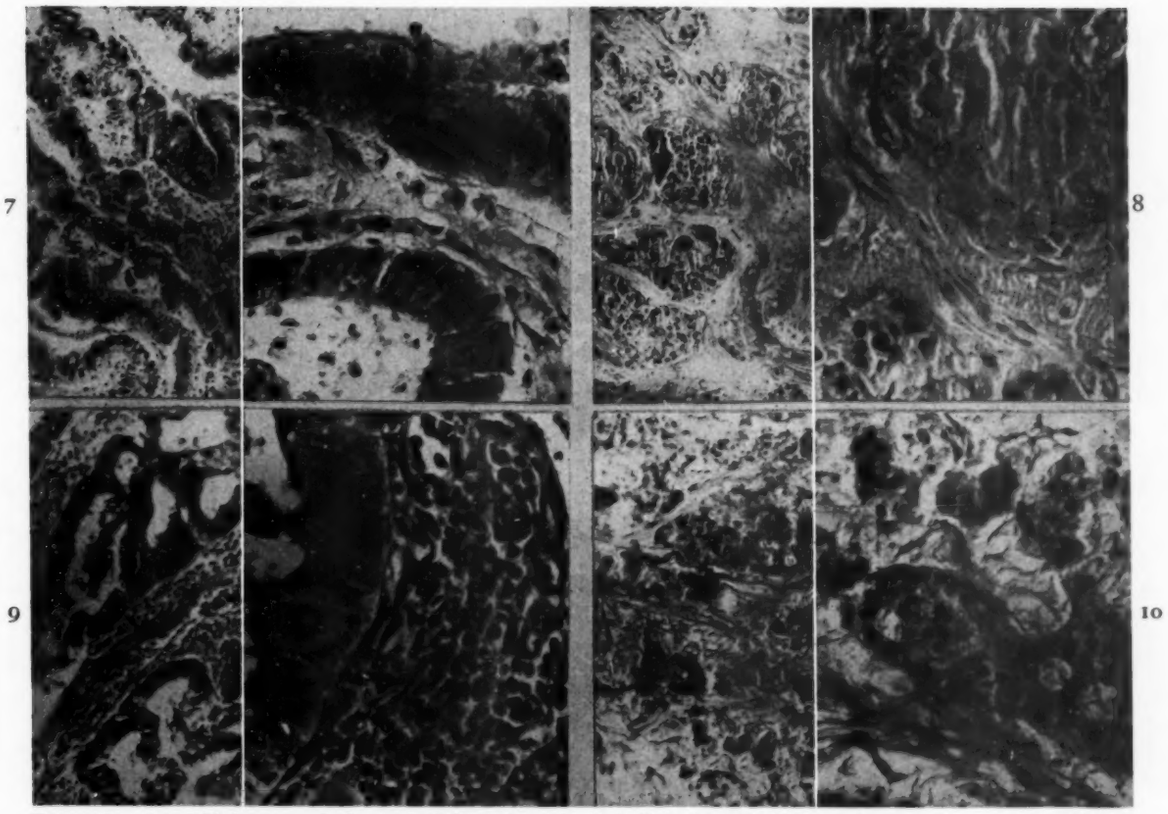

FIG. 7. Low and high power before administration of urecholine (McD.). FIG. 8 Same after use of urecholine (McD.). FIG. 9. Low and high power before administration of urecholine (G. M.). FIG. 10. Same after use of urecholine (G. M.); as noted by Dr. William Moitrier, Jr., Pathologist, St. Mary's Hospital, Brooklyn, N. Y.

teriorly (Fig. 3) which enlarged and discharged a clear fluid resembling plasma. Carcinomatous tissue later appeared in the base of this discharging area definitely demonstrating the origin of the fluid. The same phenomenon occurred laterally, especially on the left side. (Fig. 4.) The carcinomatous tissue became necrotic on the surface, while specimens taken from deeper layers showed no unusual changes grossly (Figs. 5, 6.) However, they did show microscopic changes in that the connective tissue was partially edematous. (In several other cases so treated this same observation has been made.) (Figs. 7 to 10.) The fluid discharge from the surface of the carcinoma became profuse. Its origin and some of its characteristics could easily be observed.

This patient finally died, four months after institution of this therapy. No sedatives other than nembutal were given at night and obstruction never occurred. As necrosis proceeded, the lumen became much larger. (Fig. 5.) Permission for a limited autopsy (abdominal and perineal) were obtained. No metastasis was found. Pathologic reports described necrosis of the surface of the carcinoma, at some points for a depth of 1.5 cm., and edema in much of the deeper malignant tissue.

On the long chance that parasympathetic stimulation had in some degree influenced the course of this case and had produced edema in the carcinoma and prevented the onset of pain and obstruction, it was decided to test the theory further. Urecholine was administered in several late cases of rectal or sigmoid cancer. In general, results were much the same, although, of course, pain was not avoided or diminished in all cases. When started late, the therapy had no effect and was completely ineffectual in those instances in which opiates had been used for some time. The course of thirty-seven cases is briefly summarized in Table 1. It is to be noted that twenty-one patients, according to their own statement,

TABLE 1

Patient	Sex	Age	Living or Dead	Site	Metastasis	Therapy		Pain	Previous Surgery	Autopsy	Skin
						Oral	Hypo				
A. W.	F	62	L	Rectum	None	Urecholine	None	None	Local cauterization 1 yr. ago; cardiac: resection refused	....	Smooth; no cream used
E. S.	F	74	L	Rectum	Fixed to pelvic wall	Urecholine	None	None	Colostomy	....	Smooth; no cream used
A. S.	F	78	L	Rectum	Fixed to pelvic wall	Urecholine	None	None	Colostomy	....	Smooth; no cream used
C. B.	F	76	L	Rectum, vagina	Fixed to pelvic wall	Urecholine	None	None	Refused	....	Smooth; no cream used
R. N.	F	71	L	Rectum	Liver	Urecholine	None	None	Colostomy	....	Smooth; no cream used
H. K.	M	64	L	Rectum	Liver	Urecholine	None	None	Colostomy	....	Smooth
M. G.	M	73	D	Recto-sigmoid	Extension to pelvis	Urecholine	None	None	Colostomy	None	Smooth
A. S.	F	66	D	Rectum	Liver	Urecholine	None	None until last 3 da.	Colostomy	None	Smooth; no cream used
J. F.	M	58	D	Rectum	Liver	Urecholine	.....	None	Colostomy	None	Smooth
S. B.	F	69	D	Rectum	None	Urecholine	None	None until last 2 da.	Actual cautery operative; resection refused	None	Smooth; no cream used
E. H.	F	61	D	Rectum	Liver, sacrum, vagina	Urecholine	Pantopon last 7 wk.	None until last 7 wk.	Perineal excision of rectum and posterior vaginal wall	Yes	Smooth; no cream used
J. H.	M	57	D	Rectum	Liver and peritoneum	Urecholine	None	Last 3 da.	Colostomy	None	Smooth
J. H.	M	59	D	Rectum	Liver and bladder	Urecholine	None	None	Colostomy	None	Not smooth
W. M.	F	70	D	Rectum	Pelvis and lateral peritoneum	Urecholine	None	None	Colostomy	None	Smooth; no cream used
W. McC.	M	69	D	Rectum	Liver	Urecholine	None	None	Colostomy	None	Smooth
M. McD.	F	55	D	Rectum	None	Urecholine	None	None	Local cauterization	Yes	Smooth; no cream used
L. F.	F	75	D	Rectum	Pelvic peritoneum retroperitoneal glands	Urecholine	None	None until last 3 da.	Colostomy	None	Smooth; no cream used
J. L.	M	70	D	Rectum	Liver, lungs, mesenteric glands	Urecholine	None	None	Colostomy	Yes	Smooth
A. H.	F	81	D	Recto-sigmoid	Liver, uterus, peritoneum	Urecholine	None until last wk.	None until last wk.	Colostomy	None	Smooth; no cream used
C. B.	M	73	D	Rectum	Liver, peritoneum	Urecholine	None	None	Colostomy	None	Smooth
M. G.	F	64	D	Recto-sigmoid	Liver	Urecholine	None	None	Abdominal perineal resection	Yes	Smooth; no cream used
C. M.	F	53	L	Sigmoid	Liver	Urecholine	None	None	Colostomy	....	Smooth; no cream used
T. C.	M	44	D	Recto-sigmoid	Liver, mesenteric glands	Urecholine, codeine	Pantopon	Severe	1st and 2nd stage Mickulitz	None	Smooth
J. F.	M	70	D	Sigmoid	Extension to skin and iliac crest	Urecholine, pantopon	Pantopon	Severe	1st and 2nd stage Mikulitz 7 yr. ago	None	Dry
N. D.	M	79	D	Rectum	Liver	Urecholine, codeine	Pantopon	Severe last 4 mo.	Colostomy	None	Smooth
E. D.	F	74	D	Rectum	Extension to uterus and vagina	Urecholine, demorol	Morphine	Severe last 6 mo.	Colostomy	None	Smooth; no cream used
B. G.	F	59	L	Rectum	Extension to vagina cervix and pelvic walls	Urecholine, pantopon	None	Severe last 4 mo.	Colostomy	....	Smooth; no cream used
M. McG.	F	67	L	Rectum	Liver	Urecholine	None	Pain last 5 mo.	Actual cautery	....	Smooth; no cream used

TABLE 1 (*Continued*)

Patient	Sex	Age	Living or Dead	Site	Metastasis	Therapy		Pain	Previous Surgery	Autopsy	Skin
						Oral	Hypo				
S. N.	F	77	D	Rectum	Liver	Urecholine, pantopon	Pantopon last 3 mo.	Severe last 3 mo.	Colostomy	None	Smooth; no cream used
J. M.	M	58	D	Rectum	Sacrum	Urecholine	Demerol last 2 mo.	Severe last 2 mo.	Abdominal perineal resection	Yes	Smooth
V. S.	M	64	D	Rectum	Sacrum	Urecholine	Pantopon last 3 mo.	Severe last 3 mo.	Anterior resection, later colostomy	None	Smooth
G. M.	F	58	D	Rectum	Peritoneum; left ureter	Urecholine	Morphine demerol last 3 mo.	last 3 mo.	Colostomy	Yes	Smooth; no cream used
F. K.	F	44	D	Recto-sigmoid	Liver, vagina	Urecholine	Morphine, demerol last 5 mo.	last 5 mo.	Resection	Yes	Smooth; no cream used
W. B.	M	66	D	Rectum	Spleen, lymph glands	Urecholine	Demerol last few weeks	last few wk.	Colostomy	Yes	Smooth
W. S.	M	62	L	Rectum	Fixed to pelvic walls	Urecholine pantopon	past few wk.	past few wk.	Colostomy	....	Smooth
A. L.	M	71	D	Rectum	Liver, bladder	Urecholine	Pantopon last 5 mo.	last 5 mo.	Colostomy	None	Dry
B. T.	F	79	D	Rectum	Liver	Urecholine	Pantopon last 3 mo.	last 3 mo.	Colostomy	None	Smooth; no cream used

had no pain. Some are still living, although the list is growing shorter. To amplify this statement regarding pain it can be stated that these patients did not receive opiates, unless in their last twenty-four to seventy-two hours. Some used seconal or nembutal at night. Those who were not relieved, as noted, had the usual severe pain and were given morphine or pantopon in ever increasing doses. Whether or not the first mentioned group, untreated, would have gone through to the end without pain, I do not know, although I doubt very much that they could have done so.

While this apparent effect upon pain was a factor to be closely studied, the appearance of edema in carcinomatous tissues was even more interesting. Edema was not produced in other parts of the body. The excretion of fluid from the carcinomatous area was marked in most cases. It was readily observed when the carcinomatous mass protruded from the anal canal, invaded the skin or metastasized at the sacrum, as it did in one instance (Mr. J. M.). In such positions it was easy to dry the malignant tissue well with cotton and within a minute or two see fluid appear on the surface of the carcinoma. When lesions were inside the bowel, it was impossible to distinguish between discharges from the bowel and that from the growth, but microscopic examination of the tissues often showed edema, and fluid escaped from the rectum in unusually large quantities.

Aside from the medication applied and the theories involved, one "side" observation was made in this group of patients and in many early cases in which prompt surgery was done. Most of these patients had unusually fine skin. It is the only "common denominator" that I have ever observed in connection with carcinoma of the rectum and of course it is a point that can give rise to considerable debate.

This exceptionally smooth skin is elastic, luminous and soft to the touch. When compared microscopically with "dry" skin from a noncancerous patient, there are no distinguishing features, on the surface, in the connective tissue, or in the elastic fibers. In males, one occasionally can obtain a history of noticeably smooth skin, sometimes called "baby skin" but usually no help is received from the patient's history. With the females, however, a very definite statement regarding their skin is often made. The women say that they never had to use facial cream.

In the past four years, it has been noted that only two females with cancer of the rectum used facial cream.

To summarize, over 500 cases of pruritus ani have been seen with no evidence of cancer of the anal canal or perianal skin. Chronic irritation

of these areas had, of course, been present for a long time.

On the assumption that overstimulation of the parasympathetic nervous system was a factor in producing pruritus ani, parasympathetic stimulants were given to thirty-seven patients with carcinoma of the rectum. Urecholine, 15 to 30 mg., was administrated three times per day. Absence of pain was noticed in twenty-one cases. In two more instances pain was present only during the last three to seven weeks. Pain was not prevented or diminished in fourteen cases. An increased discharge of clear, plasma-like fluid was noted in most cases, and upon microscopic examination edema of the connective tissue was noted in many instances.

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The onset of hematemesis in patients with cirrhosis of the liver is serious because over one-half die within one year. The portal hypertension present in these cases can be successfully relieved by portacaval shunt, wherein the portal vein is anastomosed to the inferior vena cava; others perform splenectomy and then anastomose the splenic vein, end-to-side, to the left renal vein. Much blood is thereby shifted from the portal system to the caval system where pressures are much lower. The resultant fall in portal pressure diminishes the incidence of esophageal hemorrhages as well as the amount of ascites, and this gives the liver a better chance to regenerate. (*Richard A. Leonardo, M.D.*)

CONTROL OF DELTOID BURSITIS WITH THE KNOTT TECHNIC OF BLOOD IRRADIATION THERAPY

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THE Knott technic of blood irradiation therapy, the only method approved by the American Blood Irradiation Society, consists of withdrawing a predetermined amount of blood (1.5 cc. per pound of body weight) from the patient's vein into a vacuum bottle containing sodium citrate, and exposing the citrated blood to radiant energy between the wave lengths of 2399 and 3900 angstrom units, using the Knott hemo-irradiator, a precision machine which exposes the citrated blood (as it passes through a quartz-windowed silver chamber) at a predetermined rate to the spectral energy from a hot mercury quartz arc lamp. The irradiated blood is then returned immediately to the patient through the needle used for the initial venipuncture. The entire procedure is a closed type of transfusion, a propulsion pump being used to draw the citrated blood from the vacuum bottle through the Knott hemo-irradiator to the patient's vein.

The first report of the use of the Knott technic of blood irradiation in deltoid bursitis and calcareous tendinitis was made in 1951 by Neff and Anderson,[1] who presented their results in seventeen cases of this syndrome, stating that 88.2 per cent of the patients treated received relatively rapid and complete relief of symptoms including those with both acute and chronic types of the disease. They attributed the success of the treatment to relief of pain, increased oxygenation of the blood,[2] vasodilatation[3,4] and certain biochemical effects.[5] Among the objective findings, the x-ray evidence of the disappearance of calcareous tendinitis in the acute cases was consistent and most striking.

We have had a somewhat similar experience in twenty-two consecutive unselected cases, eighteen acute and four chronic, of deltoid bursitis with or without calcareous tendinitis. In twenty of the twenty-two patients a complete and relatively rapid subsidence of symptoms occurred following the use of the Knott technic of blood irradiation.

In Tables I and II are listed the diagnostic criteria present in the twenty-two patients with deltoid bursitis who were given blood irradiation.

The following symptoms, as might be expected, were noted consistently and were considered as diagnostic criteria for deltoid bursitis: (1) excruciating pain over the deltoid muscle, often spreading down the arm and wrist; (2) limitation of motion of the shoulder joint; (3) calcareous tendinitis easily demonstrable by x-ray; (4) insomnia.

TABLE I
DELTOID BURSITIS: DIAGNOSTIC CRITERIA
(BRISTOL, CONNECTICUT, SERIES)

Case	Type*	Excruciating Deltoid Pain	Limitation of Motion	Calcareous Tendinitis	Insomnia
1.	A	+	+	+	+
2.	A	+	+	+	+
3.	A	+	+	+	+
4.	A	+	+	+	+
5.	A	+	+	+	+
6.	A	+	+	+	+
7.	A	+	+	+	+
8.	A	+	+	+	+
9.	A	+	+	+	+
10.	A	+	+	+	+
11.	C	(+ −)	(+ −)	+	(+ −)
12.	C	+	+	o	+

* A = Acute; C = Chronic.

The first group tabulated in Table I consists of twelve patients from Bristol, Connecticut. Of the twelve, ten had acute deltoid bursitis and two had chronic conditions. Excruciating deltoid pain was present in all of the acute cases and in one of the chronic cases; in the other chronic case there were only occasional periods of pain.

Limitation of motion was prevalent in all of the twelve patients except the one mentioned who had somewhat "on and off" symp-

toms of pain. Calcareous tendinitis was prevalent in nine of the ten acute cases in the Bristol series and in one of the chronic cases. Insomnia was present in eleven of the twelve cases.

In the New York City group, tabulated in Table II, there were ten patients, eight with

TABLE II
DELTOID BURSITIS: DIAGNOSTIC CRITERIA
(NEW YORK CITY SERIES)

Case	Type*	Excruciating Deltoid Pain	Limitation of Motion	Calcareous Tendinitis	Insomnia
13.	C	+	+	+	+
14.	A	+	+	+	+
15.	A	+	+	+	+
16.	A	+	+	Minimal	+
17.	A	+	+	+	+
18.	C	+	+	+	+
19.	A	+	+	o	+
20.	A	+	+	+	+
21.	A	+	+	+	+
22.	A	+	+	o	+

* A = Acute; C = Chronic.

acute deltoid bursitis and two with chronic deltoid bursitis. All ten experienced excruciating deltoid pain. Limitation of motion was present in all these patients. Calcareous tendinitis was present to a marked degree in six of the eight acute cases and in both of the chronic cases.

Thus, of the twenty-two patients treated, there were eighteen acute and four chronic cases. Limitation of motion was present in all cases but one; in the latter it was present occasionally. Calcareous tendinitis was present in eighteen of the twenty-two patients and insomnia was present in all but one.

The results of this study are classified as either completely improved or unimproved. Seventeen of the eighteen patients with acute deltoid bursitis were completely improved (94.4 per cent); one was unimproved (5.6 per cent). In the chronic group of four patients three were completely improved (75 per cent) and one was not (25 per cent). Of the total of twenty-two patients, twenty were completely improved (90.9 per cent) and two were unimproved (9.1 per cent).

CLINICAL OBSERVATIONS

We have made certain clinical observations which we believe are very important to recognize:

1. The pain of acute deltoid bursitis, with or without associated calcareous tendinitis, usually disappears within one to six hours. However, a second blood irradiation treatment two or three days after the first is frequently necessary; this second treatment is administered routinely to insure disappearance of pain. Occasionally a third blood irradiation is necessary seven to ten days after the second. No further treatment is necessary in our experience for acute bursitis.

2. Calcified areas, seen on x-ray examination, in and about the shoulder joint in cases of acute deltoid bursitis often begin to disappear within a few days after initial blood irradiation treatment. However, these calcified areas rarely show change in cases of chronic deltoid bursitis. Our experience has indicated that the long-standing calcium deposits do not disappear in the same manner as we have observed in the acute cases.

3. The pain of chronic deltoid bursitis, often present for months or years, usually begins to subside within a few days. In these patients blood irradiation is given twice at one-week intervals, twice at two-week intervals and thereafter at four-week intervals until all pain disappears. Three to four yearly blood irradiations are recommended for patients who have been suffering over a period of many years.

4. Insomnia and limitation of motion tend to disappear as the pain subsides. Insomnia is cured very early and limitation of motion is one of the last symptoms to disappear.

The disappearance of calcareous tendinitis is extremely interesting. Calcareous tendinitis was present in sixteen cases of acute deltoid bursitis and in all of the four cases of chronic deltoid bursitis. In ten of the patients with acute deltoid bursitis there was a disappearance of calcium. Academically this is an interesting finding. However, many other writers have pointed out that the disappearance of calcareous tendinitis occurs as the inflammation subsides, whether that subsidence involves a long or a short period of time. We believe the really important factor is the rapid subsidence of pain and other symptoms.

Those patients who have received intensive

x-ray therapy without benefit respond more slowly to blood irradiation therapy than patients who have not. Some process apparently takes place in the soft tissues after x-ray therapy and these patients seem a little more refractory to treatment.

CONCLUSION

The Knott technic of blood irradiation is a safe and efficient method of rapidly controlling acute deltoid bursitis. It is also a safe and efficient method of treating chronic deltoid bursitis.

SUMMARY

1. Twenty-two consecutive unselected cases of deltoid bursitis are reported in which the Knott technic of blood irradiation has been used.

2. Eighteen were cases of acute deltoid bursitis, and four were cases of chronic deltoid bursitis.

3. In sixteen cases of acute deltoid bursitis and four cases of chronic deltoid bursitis, calcareous tendinitis was present.

4. In ten cases of acute deltoid bursitis with calcareous tendinitis, the calcium deposits disappeared after treatment.

5. Following use of blood irradiation therapy rapid relief of pain, followed by disappearance of limitation of motion and insomnia, occurred in seventeen of the eighteen cases of acute deltoid bursitis and in three of the four cases of chronic deltoid bursitis. Twenty of the twenty-two patients were improved or 90.9 per cent, a close approximation of the 88 per cent improvement reported by Neff and Anderson.[1]

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ARTERIOGRAPHY OF THE HIP JOINT FOR PREDICTING END RESULTS IN INTRACAPSULAR AND INTERTROCHANTERIC FRACTURES OF THE FEMUR*

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ARTERIOGRAPHY as a possible aid to the prognosis of healing of hip fractures in elderly patients was studied in twelve cases. Any technic to be used in this situation must be subjected to two primary considerations. First, it must be easy and safe and in no way detrimental to the elderly patient's progress, since the aged are frequently in poor general health. Second, it must be practical and promise maximal results. Arteriography meets the first requirement well, since it is easy of administration and safe. Its practicability and value in prognostication is the object of this study.

A careful review of the literature revealed that no study had heretofore been made to determine if there was a consistent pattern of the arterial vessels around the hip joint from which could be established a norm against which to measure variations. The present study consisted of four phases: (1) determination of the pattern of the arterial vessels supplying the normal healthy hip joint by injecting the femoral artery and filling the vessels in retrograde fashion after applying a pneumatic tourniquet to the lower thigh; (2) examination of the ligamentum teres from postmortem specimens to determine the existence and extent of vessels in that region; (3) comparison and notation of differences between the established norm and the arteriographs of patients suffering from intracapsular and intertrochanteric fractures of the femur; (4) classification of the changes, if present, and by means of following the patient, determination of any relationship existing between the changes noted and the final outcome of the fracture.

The study was considered worth while even if it would reveal that the procedure could offer no help in the treatment of these fractures. It was also envisioned that the changes in vascular pattern, if found, would not be the result of disruption due to trauma but would, rather, be an anatomic defect. Study of such anatomic anomalies might disclose whether the fracture would heal, be retarded, go on to non-union or whether aseptic necrosis of the head of the femur would eventually result.

THE VASCULAR PATTERN

Exhaustive study of the literature reveals much confusion regarding the vascularity of the hip joint. Hegetor, one of the later Alexandrian medical writers who lived about 130 B.C., recognized the presence of the ligamentum teres or round ligament of the hip joint. Controversy concerning its vascularity did not begin until Paletta stated that the obturator artery gave off a small branch which passed through the acetabular fossa and divided into two branches: one for the fossa and one which traversed the round ligament to supply the head of the femur. Since this statement was made, there has been much controversy as to the vascularity and importance of the ligamentum teres in regard to the nourishment of the femoral head.

Review of the literature supports Kolodny's[2] statement made in 1925 that "men like Henle, Hyrtl, Karl Langer, Luschka and Poirier have never come to a uniform opinion as to the nutrition of the femoral head." However, Tucker[4] in 1949 and Howe, Lacey and Schwartz[1] in 1950 published fine, detailed reports of the circulation of the hip region, the former studying injected specimens, the latter beautifully describing the gross anatomy. With all due respect to the standard anatomy texts, a detailed description of the gross relationship and distribution of the arteries of the hip region must be searched for elsewhere.

Howe, Lacey, and Schwartz dissected forty

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human adult hips, and it was their opinion that in children the foveal vessels assume a small role in supplying the femoral head, and that in adults, although the foveal arteries are larger and usually nourish the femur, they are inadequate in many instances.

It has been conclusively proved that the ligamentum teres does supply some nourishment in most cases. However it is also true that the head and neck of the femur depend upon the blood received from the capsular vessels, particularly from the branches of the medial and lateral circumflex arteries. No more nor less can be said.

ESTABLISHMENT OF AN ARTERIAL PATTERN

Following the descriptions of Howe, Lacey and Schwartz and standard anatomy texts four hips were dissected in cadavers. The common femoral profundus and its branches were dissected out. The medial and lateral circumflex vessels, the first perforating, the larger capsular branches of the former and the ascending branches of the perforating artery were found. The inferior and superior gluteal vessels were dissected out, but the capsular branch of the inferior gluteal could be followed only to the level of the trochanter. The obturator artery could be traced to the acetabular notch, but no branches to the ligamentum teres could be found or anastomotic branches with the gluteals or medial femoral circumflex. The anastomotic vessels between the medial and lateral circumflex in the region of the trochanter were not found, partly due to the condition of the specimens. A total of six ligamentum teres were examined; no macroscopic vessels could be found. Figures 1A, B and C diagrammatically represent the main vascular supply as visualized from the anterior, anterolateral and posterior aspects of the hip region.

From these three diagrams a fourth or composite diagram was made (Fig. 1D) representing an anteroposterior view as the vessels might appear radiographically if they were radiopaque. By injection of the common femoral artery in postmortem specimens and in clinical cases an arteriogram of the vascular pattern was obtained. This was compared with the composite diagram and, surprisingly enough, was very similar in detail to the theoretic picture built up on an anatomic basis. (Note how similar Figure 1D, the first composite, is to the arteriograms of the cases presented.) A second composite diagram was then constructed by making the changes to the first composite (Fig. 1D) dictated by the various arteriograms. The arteriograms used to establish a so-called normal pattern were considered normal insofar as the filling was good and the major branches of the femoral and profundus arteries were of good size. This second composite diagram (Fig. 1E) was then used as the standard with which other arteriograms could be compared.

The answer that was sought for in this study was whether a fracture with a defective vascular pattern would heal as well as one in which vessels were abundant and large, and easily discernible on the arteriogram.

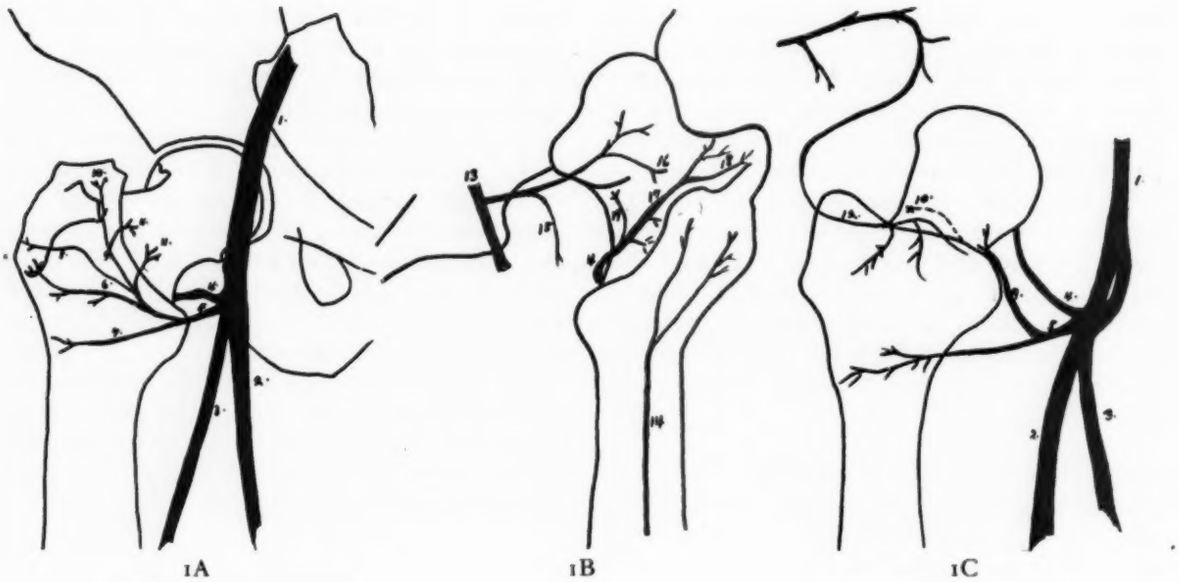
PROCEDURE

Diodrast in a 35 per cent solution was chosen as the contrast medium to be used because of its quality as a radiopaque substance, its low irritant qualities and its speed of elimination.

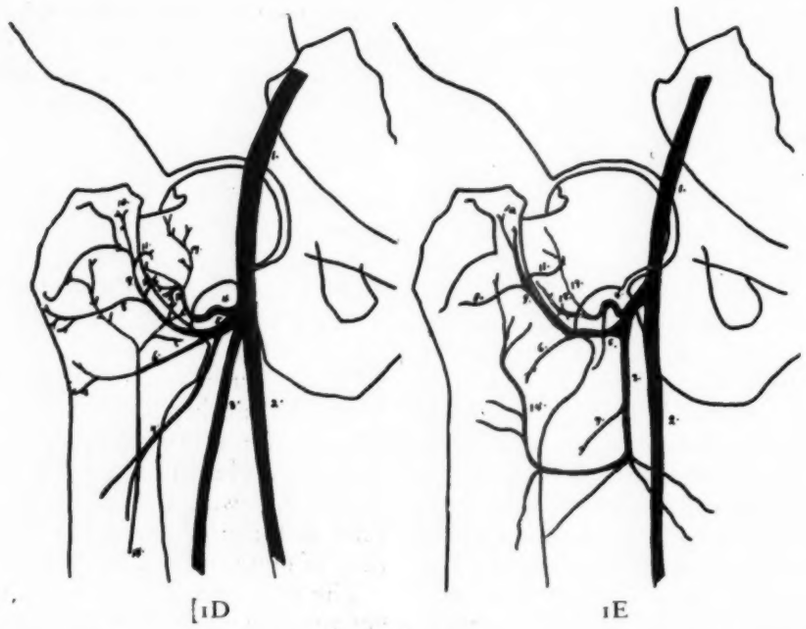
The procedure was as follows: 20 cc. of 35 per cent diodrast was injected into the common femoral artery by direct arterial puncture just below the level of the inguinal ligament, using an 18-gauge needle. A pneumatic tourniquet was placed on the mid-thigh with a total constricting pressure of 12 pounds. The solution was then injected as fast and with as much force as possible, the x-ray being taken when all but 2 cc. had been injected. The arteriograms were made on 10- by 12-inch film through a Bucky grid, employing the following factors: 85 kv., 150 ma. at a tube distance of 36 inches with an exposure time of one-fifth of a second.

The arteriograms were taken postoperatively not through choice but because it was believed that the procedure might interfere with preparing the patient for operation. However, any operative interference with the vascular supply should be included on the arteriogram although it is very doubtful if any interference occurs. Consequently the postoperative arteriogram would be as good, if not better, than one made preoperatively. All cases in this series were nailed by the "blind technic," using x-ray control with no surgical interference with the capsule.

In five cases portable arteriograms were taken on the operating table following closure

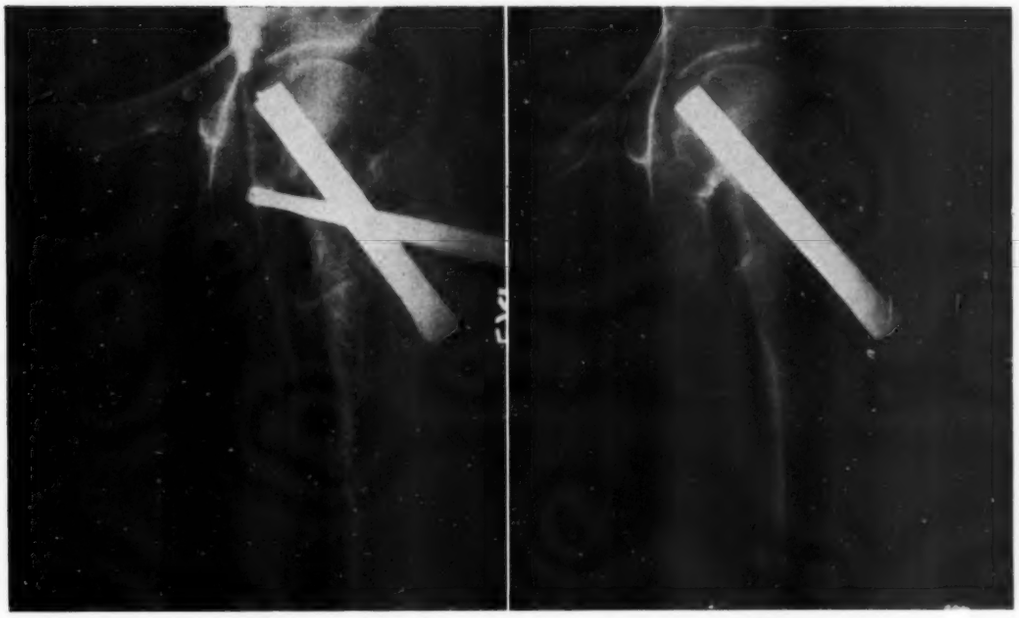


1A 1B 1C



1D 1E

FIG. 1. Diagram of arterial pattern. A, anterior; B, posterior; C, anterolateral; D, composite diagram; E, corrected composite. The numbers used in the illustrations represent the following: (1) common femoral artery; (2) superficial femoral artery; (3) profundus artery; (4) medial femoral circumflex artery; (5) lateral femoral circumflex artery; (6) muscular; (7) muscular; (8) trochanteric branch of the lateral femoral circumflex; (9) anterior cervical branch of the lateral femoral circumflex; (10) branch of the lateral femoral circumflex near point of anastomoses with medial femoral circumflex; (11) capsular branches at base of neck from the lateral femoral circumflex; (12) trochanteric branches of the superior gluteal artery; (13) inferior gluteal artery; (14) trochanteric branch from first perforating artery; (15) branch of the inferior gluteal artery to the external obturator foramen; (16) branch of the inferior gluteal artery to the obturator internus and gemelli muscles; (17) posterosuperior capital branch of the medial femoral circumflex artery; (18) trochanteric branch of the medial femoral circumflex artery; (19) posteroinferior capital branch of the medial femoral circumflex artery.



2A 2B

FIG. 2. Intracapsular fracture of femur. A, poor vascular pattern demonstrated by arteriography; B, the resulting early non-union. This arteriogram was typical of those obtained on patients in the series who had poor vascular supply.

of the incision. The arteriograms obtained were technically just as good and quite satisfactory. (Fig. 3A.)

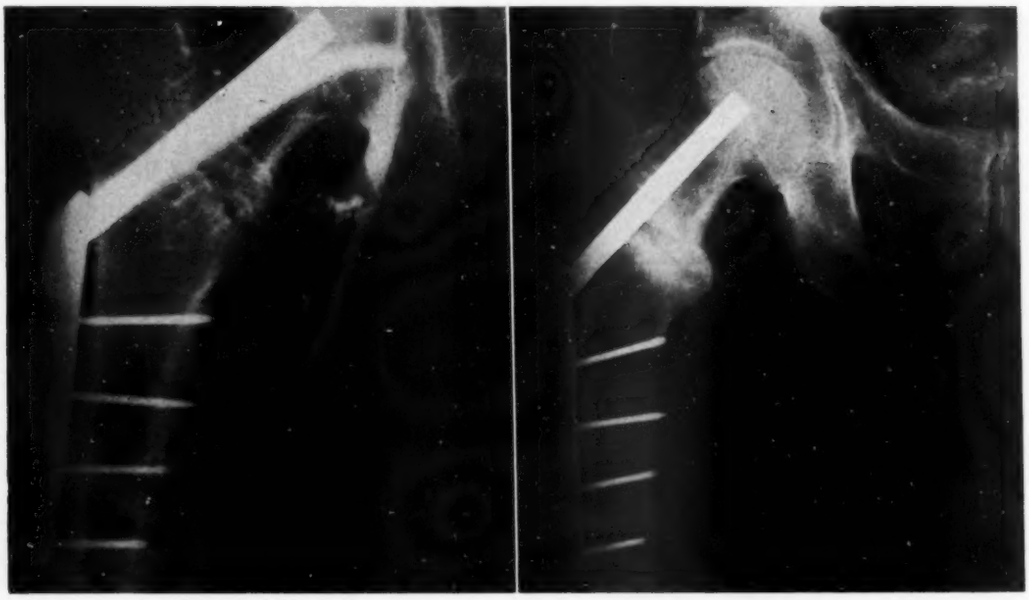
In taking a portable arteriogram the procedure of injection was the same except that the exposure was taken after 15 cc. had been injected. Again a 10- by 12-inch film was used with a Lysholm grid incorporated in the casette. The factors in this instance were: a tube distance of 32 inches, 78 kv., 15 ma., with an exposure time of two and one-half seconds.

All patients had been tested for sensitivity twenty-four hours previously by intravenous injection of 1:1000 solution of sterile diodrast. In no case was any sensitivity shown either on the test dose or following the full 20 cc. of 35 per cent diodrast.

No complications resulted from the procedure. Hematomas at the site of injection did not occur. There was no vascular disturbance either from use of the dye or from sudden dilation of the vessel at the time of injection. In every case the taking of the arteriogram appeared to be a benign procedure. Wound healing was not impaired, nor did any hemorrhage occur at the operative incision following use of the tourniquet which created a high arterial pressure, even though in five cases the procedure followed directly upon closure of the incision.

By this use of arteriography the following arterial pattern was obtained: The common femoral was well filled up to and often including the common iliac. The profundus, perforating arteries and superficial femoral also filled well. No difficulty was found in filling the trochanteric branches of the ascending branch of the first perforating artery. The medial and lateral femoral circumflex arteries, when they were present, filled well, although their origin varied greatly and their relative sizes sometimes were reversed (i.e., the medial femoral circumflex being quite small and tortuous while the lateral circumflex remained large). It was possible to see the trochanteric, anterior cervical branches, and anastomosing branches of the lateral femoral circumflex. The trochanteric and posterosuperior capsular branches as well as the inferior capsular branches of the medial femoral circumflex could also be filled. The cervical vessels of the capsular branches of the medial femoral circumflex could be seen on some arteriograms. The obturator, nutrient and gluteal vessels and the vessels of the ligamenta teres, if present, were not filled.

In summary, then, the estimation of the



3A 3B

FIG. 3. Intratrochanteric fracture of femur. A, good vascular pattern demonstrated by arteriography following internal fixation of fracture. B, early union at two and a half months.

arterial pattern rested on the presence or absence of those vessels which could be filled; whether a defect in these was sufficient evidence of abnormality had to be determined.

SUMMARY

Nine patients with intracapsular and three patients with intertrochanteric fractures of the femur were studied by means of arteriography to determine if any significant abnormality could be found in the vascular pattern and, if such existed, if it bore any relationship to the end result of the fracture. Of the twelve patients, eight were female and four were male. The age range was from twenty-five to eighty-one years. There were no deaths in the series and no untoward reactions of any kind due to the procedure.

Two of the twelve patients were discarded from the study because of the poor quality of the arteriograms obtained. Two patients had excellent blood supply and the fractures showed very early union. Four patients had a definitely inadequate blood supply as shown by arteriography. Of these four, one showed early evidences of non-union; one went on to absorption and aseptic necrosis; one displayed union at sixteen months; and in the other the neck of the femur was shortened by absorption, but union occurred. Three patients had a limited blood supply as indicated by arteriography. One of these three showed a good supply, although inadequacies existed, and there was early union of the fracture. One showed a fair supply only, but there was early union of the fracture, contrary to results expected. One showed a limited but apparently adequate blood supply and healing was slow with the fracture line still visible at eight months. The remaining patient had a moderate to poor blood supply. In this case there was absorption of the head of the femur but union began at eight months.

Figure 2 shows a poor vascular pattern as determined by arteriography, and is representative of such cases found. The medial femoral circumflex was absent. No trochanteric, capsular or cervical vessels were seen. The lateral femoral circumflex was present. This patient did poorly and showed early non-union at four months.

Figure 3 illustrates an excellent blood supply. Both lateral femoral circumflex and medial femoral circumflex are large with many capsular and cervical branches well filled. The fracture, though trochanteric, showed early union at two and one-half months.

CONCLUSIONS

No conclusions can be drawn and no statistical evidence can be presented from such a

small series. Only a large series with long and accurate follow-ups could prove or disprove certain impressions which developed during the course of the study. Firstly, in individuals who show an anatomically poor vascular pattern (providing the arteriogram is of good quality) healing of hip fractures is likely to be poor. Secondly, it would appear that the absence of the medial femoral circumflex is of significance, since patients with this deficiency did poorly. In the author's opinion, although the complete vascular supply cannot be shown in a living person, certain conclusions can be drawn with regard to the whole supply by examination of some of its parts. It seems reasonable that if the vascular supply, including the femoral profundus and circumflex arteries and their branches, is thin and tortuous, or in part absent, it is probable that the other units are equally disturbed or deficient. It should be reiterated that these are impressions only which are still open to proof and are not positive conclusions.

The one conclusion we have been able to draw is that, in this series, arteriography was safe and applicable as a routine procedure in studying cases of intracapsular and intertrochanteric fractures of the femur.

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REVIEW OF SPINA BIFIDA AND CRANIUM BIFIDUM*

WITH FOLLOW-UP STUDIES OF EIGHTY-ONE CASES

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THE early care of congenital anomalies often is not definitive but must be directed toward avoidance of future complications. This series of cases of spina bifida and cranium bifidum has been studied to determine how well surgical treatment has met this goal.

EMBRYOLOGIC REVIEW

It has been learned by studies of various lower vertebrates that the three germ layers arising from the blastopore eventually complete the crude groundwork which results in a complicated mechanism. Spemann[1] and coworkers believe that a chemical or organizer substance brings about the formation of the embryo, with each system adhering to a strict schedule. He has shown that neural structures, ectodermal in origin, can form only after a normal mesodermal substratum has formed. It is at this embryonic stage, which in man[2] occurs between the twenty-first and twenty-ninth day of gestation, that the origin of neural malformations such as spina bifida and cranium bifidum occur. Experimental work by Ancel[3] and Snell, Bodeman and Hollander[4] has shown in various animal embryos that irradiation, injection of chemical agents and excessive temperature have resulted in abnormalities of the central nervous system similar to spina bifida and cranium bifidum seen in the human being. Gregg[5] noted an association between development of rubella in the mother and the occurrence of congenital defects of the eye and heart in the child. He speculated as to whether the cells most actively engaged in crucial points of organogenesis may not be so affected by the disease process that aberrant development results.

To test this theory against the seasonal incidence of infectious diseases in the present series the probable month of conception of the eighty-one patients seen in this clinic from 1944 through 1950 was determined in an attempt to show a seasonal relationship, if any. As can be seen from the graph (Fig. 1) it might be concluded that winter, with its increase in upper respiratory infections, may influence the incidence of anomalies. Also of interest is the summer peak similar to that of poliomyelitis.

In contrast to the environmental factors Murphy[6] concludes that "gross human congenital malformations arise solely from influences which affect the germ cells prior to fertilization." He demonstrated that a congenital malformation will occur with twenty-five times greater frequency than that of the general population when an offspring is born to parents already possessing a malformed child. In this series five patients (6.2 per cent) gave a history of sibling malformations:

1. R. A., female; fourth child. No familial history of deformities; mother's first pregnancy resulted in a miscarriage; the second was terminated at full term but child died in the second month from unknown cause; the third child had a congenital heart lesion which was not compatible with life.

2. Baby D., female; third child. Negative parental history of anomalies; mother's first child had congenital atresia of the bile ducts; the second child was normal.

3. E. H., male; sixth child. Four normal siblings and one who died as result of hydrocephalus.

4. G. M., male. Four siblings with one who died in fifth month as result of spina bifida.

5. M. T., female. One sibling who died as result of spina bifida and hydrocephalus.

Weiner[7] more specifically is in accord with Murphy's theory. He suggests that isosensitization of the mother to antigens present in the blood of the fetus can injure the fetus when maternal antibodies pass into it through the placenta. The lesions are then produced by

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blockage of the terminal blood vessels by clumps of erythrocytes.

REVIEW OF CASES

In limiting this study to the eighty-one cases of spina bifida and cranium bifidum seen in Vanderbilt University Hospital from 1944 to 1950, we obtain a group of patients who have reached an age when normal development, walking and sphincter control would be present. All of these patients have had the benefit of chemotherapy, antibiotics and recent advances in physiotherapy. We have lost contact with thirteen of this group, but enough was known prior to discharge so that the eventual outcome only will be affected statistically.

Spina bifida has been estimated to occur in about one in every 1,000 newborn infants.[8,9] During the period of this study there were 10,390 live births in this hospital and ten of these infants demonstrated the lesion under discussion, an incidence of 1 to 1,039. Of the eighty-one patients with spinal anomalies thirty-seven were male and forty-four female; there were eighty white patients and one Negro. Table 1 lists the sites of the defects, further substantiating that the lumbosacral region is the most common site of occurrence. In this group sixty-eight of seventy-nine cases, or 87 per cent, were meningomyelocele (as diagnosed at time of operation and/or by symptoms) and ten, or 13 per cent, meningoceles. These figures are similar to those of Penfield and Cone.[10]

The outlook for treatment has been very poor and because of this Campbell[11] advocates a long waiting period. During this time the hopeless patients with meningomyelocele die with intercurrent respiratory infection, meningitis, ascending urinary sepsis or other complications. Treatment of this selected group resulted in salvage of only 30 per cent who were normal or nearly so. In this clinic all but seventeen of the eighty-one patients were operated upon. Of these seventeen (Table II), seven were known hydrocephalics, one had an associated encephalocele and three died from infection. Operation was not performed in the

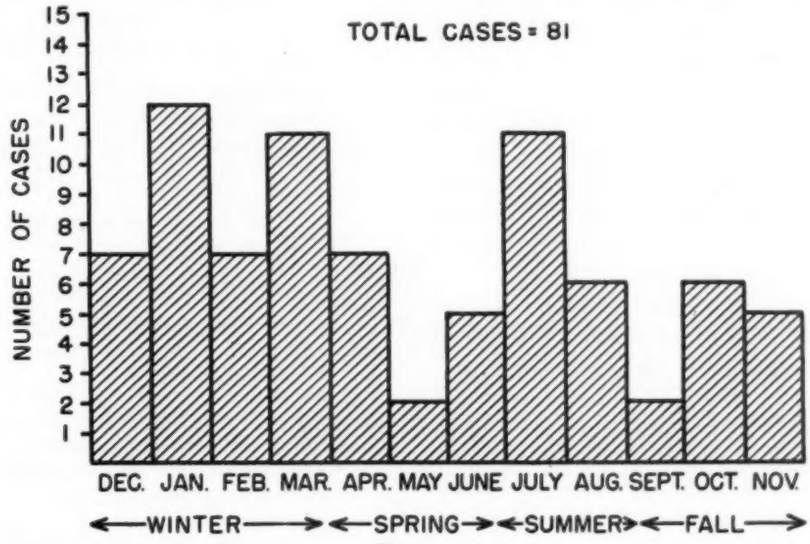

FIG. 1.

TABLE I

LOCATIONS OF SPINA BIFIDA AND CRANIUM BIFIDUM IN THIS SERIES

Nasal	0
Occipital	4*
Cervical	1
Thoracic	2
Thoracolumbar	10
Lumbar	46
Lumbosacral	15
Sacral	4

* Double anomaly present in one: occipital plus lumbar.

TABLE II

NON-OPERATIVE—POOR RISKS

Hydrocephalus	7
Prematurity	1
Multiple congenital anomalies	1
Associated encephalocele	1
Infection	3
Poor outlook because of severity of lesion	4

remaining four because of the poor outlook as a result of the severity of the lesion. Fifty-five patients (excluding those with cranium bifidum) had repair of spina bifida with careful dissection of cauda equina or neural plaque when encountered, with closure of dura, fascia and skin when possible. It was noted that in six, or 10.9 per cent, of these patients at least temporary additional loss of motor function developed in the lower extremities postoperatively; this demonstrates numerically the difficulty involved in preserving nerve tissue. For this reason Kredel[12] has removed as little as possible of the sac, conserving varied amounts of dried parchment membrane often encountered which is attached to the sac.

It has been the opinion in this clinic as well as elsewhere that drainage from a ruptured membrane constitutes justification for operation. Despite this there have been six early deaths attributable to meningitis in this series.

The development of hydrocephalus is the most common initial complication and contributes to the high mortality. In our group there were thirty-five patients, or 43 per cent, with varying degrees of hydrocephalus. Signs of increased pressure developed in nineteen cases (23.4 per cent) but because of slow progression were untreated. Of this group eleven (13.5 per cent) are living, with apparently permanent arrest of this complication; eight have subsequently expired. Sixteen patients (20 per cent) underwent surgical intervention because of very rapid change in head circumference which was progressive. Ten patients in this group (12.5 per cent) expired during or soon after the procedure, indicating that these patients are very poor surgical risks; two (2.5 per cent) are living, with arrested hydrocephalus and normal mental function; one has been lost to follow-up; the remaining four patients in this group had a cervical laminectomy and then required further attempts at currection of hydrocephalus; one has expired and two have been lost to follow up. We then have eighteen patients (27 per cent) who are known to have expired as a result of hydrocephalus. It is of interest to analyze these figures more closely to demonstrate the relationship of the repair of the lesion to the development of hydrocephalus. In nine cases hydrocephalus developed prior to repair of the defect. Seven of this group were not amenable to surgery because of this complication. Two who were operated upon died while the procedure was in progress. Seventeen of the eighteen patients were shown at operation or postmortem examination to have the Arnold-Chiari herniation. This finding contrasts with that of Ingraham[13] who reported only twenty cases of Arnold-Chiari malformations from his series of 546 cases of spina bifida in 208 of which the patient exhibited hydrocephalus.

TABLE III

IMMEDIATE CAUSE OF DEATH*

Unknown	15
Meningitis	6
Postoperative	5
Pneumonia	3
Operative	2
Prematurity	1
Multiple congenital anomalies	1

* Twenty-two patients, or 27 per cent, died while in the hospital.

TABLE IV

ASSOCIATED CONGENITAL ANOMALIES

Club feet	11
Inguinal hernia	3
Agenesis of kidney	2
Absence of ribs and vertebra	2
Fetal lobulations of kidney	1
Myelodysplasis—thoracolumbar	1
Imperforate anus	1
Mongoloid	1
Hypoplasia right cerebellar hemisphere	1
Patent urachus	1
Dislocated hips	1

The foregoing statistics and information have given the picture of initial attempts to keep the infants alive during the crucial first few months. Thirty-three patients (47.4 per cent) expired (Table III) and thirteen have been inadequately followed, leaving thirty-five children in whom the late results have been tabulated. Nine of these patients, because of the sites of the lesions and absence of spinal nerve elements, have had normal development without complications. Three of the remaining twenty-six have had occipital encephaloceles repaired. The remaining twenty-three children had myelomeningoceles proven at operation. Only four of this group are free of complications. One other child has full control of sphincters but must use braces. Another has normal function of lower extremities but remains incontinent. Thus a total of six can, with some reservation, be accepted as demonstrating the benefit of early and active surgical care. Of the remaining 17 only two are unable to walk either with the aid of braces and/or crutches. This results from the aid of adequate ortho-

pedic supervision. Congenital club feet (Table IV) as well as contractures and trophic ulcerations must be combatted. It is infrequent that tendon transplants are possible since unlike the paralyses of polio entire groups of muscles are non-functioning. One patient only has benefited from this type of surgery.

The atonic bladder with its urine residual and often found retrograde renal infection has been handled unsuccessfully in this group. All have suffered from intermittant bouts of infection, and this most likely will be reflected in follow-up findings in years to come.

CONCLUSIONS

Despite a mortality of 47.4 per cent and low myelomeningocele salvage continued attempts at correction and supportive measures are important. Most parents contacted were grateful for their child despite the handicaps encountered. This is a consideration that can easily be lost in view of the generally poor results.

SUMMARY

1. An attempt to demonstrate the effect of environmental factors on human embryologic development is presented.

2. An incidence of spina bifida and cranium bifidum of approximately 1 to 1,000 newborn has been found.

3. Factors which contribute to the low salvage rate in this group of disorders are presented and discussed.

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FIBROSITIS AND THE DISC SYNDROME

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FIBROSITIS is a clinical entity in most treatises of surgery, but its interpretation by clinicians ranges from a simple untreated or chronic myositis to a frozen shoulder (periarthritis). One leading Boston orthopedic specialist believes that fibrositis and myositis should, for all practical purposes, be considered synonymous terms. Another believed that tenderness or spasm of a group of muscles could be called a fibrositis, whether of the back muscles or shoulder group. Dorland defines fibrositis as an inflammatory hyperplasia of white fibrous tissue of the body, especially of the muscle sheaths and fascial layers of the locomotor system. It is marked by pain and stiffness, also called muscular rheumatism. Finder[1] wrote, "the chief indication for manipulation of the shoulder is fibrositis of the shoulder" (frozen shoulder, periarticular adhesion formation, chronic adhesive bursitis). Under the subtitle of fibrositis he continues, "manipulation of the frozen shoulder," and under the heading of "fibrosis of the elbow" he writes about manipulation of a radiohumeral bursitis inferring the synonymous bearing with the general term, fibrositis. Gaston[2] discusses myositis and fibrositis describing the fibrositis case as a stiffness and aching back following exposure to cold and wet, with a similarity to the old picture of lumbago. He believes that fibrositis is a diffuse inflammatory process involving muscles, fasciae or both, which is in line with the definition given by Dorland. Erickson[3] classes fibrositis with rheumatic diseases. I have combed the literature in detail and have come up with a diffuse array of uses of the term fibrositis in articles describing cases of painful shoulders, non-articular rheumatism and subacromial bursitis; in such cases the fibrosis was termed "chronic periarticular fibrositis" and in the case of "tennis elbow" another form of fibrositis was described in which the tendons were primarily involved using the descriptive term, "tendon attachment syndrome." A review of the literature disclosed Stockman's book on "Rheumatism and Arthritis" written, after a thorough study of the condition, in 1920. He believed that fibrositis was the result of inflammatory hyperplasia taking place in the fasciae, aponeurosis, sheaths of muscles, nerves and tendons, ligaments, articular capsules, subcutaneous tissues and periosteum. Stockman described the small pea-sized nodules as being in muscle bundles which, on section, revealed a serofibrinous inflammation which, he stated, might become absorbed or organized. Copeman and Ackerman[4] in 1944 wrote a paper with the opinion that in fibrositis of the back the secondary pain was due to herniations of some fat lobules through a weakened fascial tissue due either to a congenital weakness or acquired trauma. Boyd,[5] in his usual descriptive manner, writes as follows in reference to fibrositis of muscle, "everyone knows how sudden crippling pain in the back may follow a simple exercise such as digging, or so trivial an exertion as stooping down to pick up a golf ball" (actually the same simple causes as attributed to disc disorders by many writers). No other hypothesis (this was written after disc disturbances became popular) serves to explain these puzzling cases in which the onset of pain is as sudden as the lash of a whip, caused in many instances by herniation of fat lobules.

Steinberg's[6] paper, written in 1942, differentiated between primary and secondary fibrositis calling attention to the small, tender pea-sized nodules, or involvement of one muscle or a group of muscles. He treated abnormal connective tissue changes with a molecular distillate of tocopherols, coming to the conclusion that primary fibrositis is a metabolic disorder connected with deprivation of Vitamin E. Moynahan and Nicholson[7] believe that the term fibrositis is synonymous with muscular rheumatism, myoglia, myositis, myofascitis, stiff neck, torticollis, rheumatic cephalagia, brachialgia, pleurodynia, lumbago and sciatica with an unknown etiology. Diagnosis, they believe, is based on history and symptoms alone, the presence or absence of nodules not being significant. They emphasize the fact that "textbooks warn of the danger of mistaking a

serious disease for fibrositis." In this connection, Gutstein-Good interprets fibrositis as a vasomotor muscular disturbance. Paul Wood mentions the role of fibrositis in cases of effort syndrome. Moynahan and Nicholson treat the condition with novocain and find one injection usually "cures." Slocumb[8] wrote an article in which he pointed out that fibrositis is often wrongly diagnosed as atrophic arthritis or chronic nervous exhaustion. In such cases the reaction of the fibrous tissues is but part of the dominant disease. He claims that reports from certain arthritic clinics show that 55 per cent of the patients observed have fibrositis with capsular fibrous tissue, intramuscular fibrous tissue, subcutaneous fibrous tissue and perineural fibrous tissue, bursae and tendons being the most frequent anatomic sites of involvement. In another paper Slocumb[9] quoted the British Ministry of Health to show that of 2,500 insured persons having rheumatic disease, 60 per cent had some form of fibrositis. He stated that palmar fibrositis could lead to Dupuytren's contracture and that perineural fibrositis was one explanation for the sciatic syndrome and brachial neuralgia. This might well be a serious factor to consider before labelling a case a disc syndrome simply because the patient has sciatic or brachial referred pains, again a reminder that there is always the danger of mistaking a serious disease for fibrositis.

Krusen[10] defined fibrositis as a chronic inflammation of white fibrous tissue characterized by formation of nodules: "nodules should be broken up and massaged away."

Having both Copeman and Ackerman's[4] work in mind, as well as the earlier work done by Stockman, the writer decided, when feasible in cases in which the diagnosis of fibrositis of the back was made, to inject the involved muscle groups with a local analgesic. Eucupin solution in oil with benzocaine and benzyl alcohol® was used in the involved area or areas. Over a period of a year fifty-one cases were selected with no history of lifting but all complaining of having severe, knife-like pains affecting the lower back muscles following sudden bending while at work. Ages varied from twenty to sixty-six years of age, forty-three of the patients being men. Eighteen of the patients had had previous back troubles. Thirty-one (70.58 per cent) of the fifty-one had been seen by other doctors and of this group, the diagnosis of ruptured disc was made in twenty-eight (90.3 per cent) of the cases, seven (25 per cent) of which had had myelograms, with two positives. After injections of the anesthetic oil in the involved muscle areas of the fifty-one cases of fibrositis, thirty-six (70.6 per cent) were cured following one or more infiltrations with accompanying physiotherapy. There are many explanations for the good results, ranging from practical psychotherapy to secondary results from immobilization and diathermy. However, the fact remains that they had definite positive results and were returned to work in vivid contrast to the cases of "suspected discs." Here again no fair analogy can be drawn as each individual case must be evaluated on its own merits, suggestive diagnosis and objective findings. Six (11.76 per cent) of these industrial back patients (in any discussion on the pros and cons of results, such a distinction is obviously important in cases getting "free" treatment with the rainbow of compensation on the horizon) had relief for several weeks followed by repetition of complaints on back motion (all of these cases had negative x-rays, sedimentation rates, etc.). Nine of the fifty-one patients (17.6 per cent) had no relief whatsoever, with two of the nine being "worse than before the treatment." In none of these cases could any definite nodules be palpated. With all of the cases being industrial it was not deemed advisable to attempt any explorations in hopes of finding and exercising any fatty hernias encountered. One of my patients, not included in this series, was a personal friend who came to my office doubled up with muscle pain following the season's initial game of golf. After his muscle injections of anesthetic oil he walked out of my office with no pain or discomfort and had no recurrence of symptoms from the involved muscle grouping.

Whether this type of case be classified as a myositis or fibrositis, the fact remains that any worker seized with such pain while bending over doing his work, will, in the majority of cases, be classified as a potential disc patient. If such a patient is immediately rushed through with myelograms showing a suggestive disc and without proper conservative treatment and study, he invariably ends up with a disc exploratory. This is the type of case that shows such a poor end result from an industrial standpoint and which was so well presented in

Dr. Aitken's[11] paper. It is quite probable that many patients classified as a poor disc result were actually cases of misdiagnosed fibrositis with a false positive myelogram due to defects caused by a dilated epidural vein, pseudo-defects produced by the tip of the lumbar puncture needle or a deformity of the spinal column itself. Such patients, for this reason as well as the many other causes for back pain other than a herniated nucleus pulposus, go through a negative exploration followed by a second and occasionally a third, with all the hazards attendant upon such type of surgery, ending up with an "arachnoiditis" and a useless back from an industrial standpoint, with indirect increased loss ratio cost for the employer and direct increase in insurance rates. This is not, unfortunately, an exaggerated condition, for I am certain nearly every insurance and industrial clinic can duplicate such cases in numbers that should impress all concerned that we have not solved the question of the industrial back, at least by disc surgery.

CONCLUSIONS

Those of us who see the end results of disc surgery in industry are appalled by the poor end results obtained by men of excellent surgical reputations. During the past year fifty-one cases diagnosed and treated as fibrositis were reviewed. A great many of these cases could well have been clinically classified as herniated intervertebral discs and, if explored, would probably have been labeled as a poor result, with a proportionate loss of such cases to industry and with a direct effect on the employers loss ratio cost reflected indirectly in the rising cost of insurance rates. It is the contention of the writer that such cases coming under the heading of fibrositis should be recognized as such, with attempted conservative treatment before submitting such a patient for myelographic studies, and possible exploration because of persistent back or "sciatic" pain.

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ADENOCARCINOMA IN THE HORSESHOE KIDNEY*

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HEMATURIA is one of the most important and significant urinary symptoms, and search for its cause is always indicated. Approximately 70 per cent of all cases of upper urinary tract bleeding will be caused by calculi, infections or tumors.[1–3] The severity of the bleeding is no indication of the severity of the underlying disease, since minute lesions such as a varix,[4] hemangioma,[5] inflammation[6] or a papilloma or adenoma[7] can sometimes give rise to the most alarming hemorrhage. These lesions may defy discovery by the ordinary radiologic means and it is sometimes necessary to resort to surgery for early diagnosis and treatment. Such was true of the author's case presented herein, in which exploration for hematuria resulted in the removal of a hypernephroma in a horseshoe kidney.

Statistically it is of interest to note that Townsend and Frumkin[8] report 159 cases of horseshoe kidney with no neoplasm; Mayers,[9] twenty cases and no neoplasm; Thompson and Pace,[10] ninety-seven cases and no neoplasm; Bell's[11] collection of 59,064 postmortem examinations revealed 373 cases of adenocarcinoma of the kidney and 119 cases of horseshoe kidneys, neither occurring simultaneously.

In the search of the literature for previous cases, difficulties arise on two points: First the distinction between a partially crossed ectopia and a horseshoe kidney is sometimes more nice than significant. Secondly, the pathologic diagnosis "hypernephroma" has not always been exceptionally clear in past literature, and it is for that reason that no detailed search was made prior to the year 1900. The following are examples of pathologic findings similar to those encountered in the presently reported case.

Wechsler[12] reported the postmortem findings of a sixty year old female dying from vascular complications of diabetes in which an adenoma of the adrenal gland with septic infarction as well as a hypernephroma in the isthmus of the horseshoe kidney were found. This report makes mention of two early cases from German literature of tumors in horseshoe kidneys in young children.

Kimbrough[13] reported the two-year observation and operation on a thirty-five year old male who had had a three-year history of hematuria. This is the only report which demonstrates a conclusive alteration in pyelograms over the period of observation.

deVries[14] reported on a fifty-seven year old male with symptoms totaling four years, in which three pathologic conditions were found: (1) nephrolithiasis; (2) neoplasm of the pelvis of the kidney and (3) hypernephroma, the latter two of which were sufficiently separated by normal renal tissue to convince the author that they were not the same lesion with metaplastic changes. This same case is also reported in Gutierrez' text.[15]

Aspinall[16] reported on the exploration of a twenty-six year old male with a preoperative diagnosis of retroperitoneal sarcoma on whom no preoperative pyelograms were done.

Goldstein[17] reported both clinical and postmortem materials of thirteen cases of horseshoe kidney in which there was one male, aged fifty-three, with a hypernephroma.

Hess[18] reported a fifty-six year old male who showed changes in the pyelograms over a period of nine days sufficient to be significant. This same case was complicated by a pyonephrosis in the so-called healthy portion but the patient eventually died of metastatic disease.

Oppenheimer[19] reported a fifty-nine year old male on whom the diagnosis of neoplasm was made on history and physical examination alone with no confirmation by pyelograms. At operation venous invasion was demonstrated and the transection traversed neoplastic tissue. This patient was re-admitted to another hospital fifteen months later where studies indicated residual neoplasm in the remaining portion of the kidney.

The Armed Forces Institute of Pathology[20] have on record three cases in the kidney

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registry of renal cell carcinoma in the horseshoe kidney. As far as can be determined, none of these cases has been reported in the literature and no clinical data are available.

Braasch and Emmett[21] demonstrate the pyelograms of a hypernephroma in a horseshoe kidney in their text; no clinical data are available.

Six of the above cases had gross hematuria as their admitting complaint. A few cases of similar neoplastic disease have been associated with crossed ectopia, pelvic and double kidneys. A few cases of pelvic epitheliomas and malignant mesoblastic neoplasms have appeared in association with the above congenital anomalies and polycystic renal disease. These are not treated with in this report.

CASE REPORT

V. T. (Gilfillan Clinic, No. 17760; Davis County Hospital No. 2135), a thirty-five year old white female, was first seen by our Clinic on April 14, 1952, for an evaluation of her urologic tract because of recurrent hematuria. Her family and past history were non-contributory. She was a gravida II, para II, the second pregnancy having been complicated by postpartum eclampsia. Her present condition started with the passage of blood for the first time in 1949. The bleeding was relatively painless and consisted of copious amounts of bright red blood as well as large clots, and the patient herself was unable to report definitely whether such bleeding was urinary or vaginal. Her attending physician considered it vaginal and she was hospitalized for a dilatation and curettage. A pathologic report indicated nothing of significance and she was discharged without further follow-up.

She was free of bleeding for approximately six months, but in July, 1950, a recurrence of total gross hematuria, this time associated with right renal colic, required her hospitalization under the care of a urologist who cystoscoped her and found the bladder to be entirely normal. Retrograde pyelograms demonstrated for the first time the presence of a horseshoe kidney, with the right pelvis on the right side and the left pelvis extending across the midline. There appeared to be mild hydronephrosis of the left half. There was no evidence of tuberculosis and there was no suggestion of kidney tumor. The urologist reported a low-grade infection (site?), and it was presumed that her bleeding was on an infectious basis. She was given the appropriate chemotherapy and was not seen again for one and one-half years, during which time she was free of hematuria.

The same urologist recystoscoped her in December, 1951, at which time the bleeding was sufficiently copious to preclude accurate determination as to whether it originated from inflammatory polyps at the bladder neck or the kidney. Pyelograms again showed the above congenital anomaly with no interval change. Urine samples from both kidneys were sterile. No specific therapy was offered at that time. After that hospitalization she developed more epigastric discomfort simulating Rovsing's syndrome and two months later, because of recurrent gross hematuria with right-sided pain, she was hospitalized in another city for twenty-seven days. During that time her hematuria was a daily occurrence associated with the passing of clots with right-sided colic, mild nausea and vomiting with the colic, no chills, fever or recognition of calculi. During this period of hospitalization, ureteral specimens were sterile, guinea pig inoculations were negative and Papanicolaou stains failed to reveal neoplastic cells. No specific therapy was offered, and she was discharged when her hematuria ceased. Within the next three months she was moderately incapacitated by increasing epigastric discomfort, especially associated with exertion, hyperextension of the back and bouts of hematuria which occurred two to three times weekly.

Physical examination revealed a well developed and nourished white female in whom positive findings were limited to the abdomen. There was diffuse epigastric tenderness and involuntary rigidity in the right upper quadrant making accurate palpation difficult. There appeared to be a tender, deep, midline and right upper quadrant mass which did not move with respiration. There was a well healed midline suprapubic scar from a previous uterine suspension. There was no abnormality of the uterus, cervix or adnexa. Her urine examination revealed an occasional white blood cell. Her complete blood count was within normal limits. Cystoscopy revealed no evidence of urethral stricture but there was moderate polypoid urethritis. The bladder mucosa was free of disease. The right ureteral meatus was slightly higher than the left. Both were active, expelling clear spurts of urine. The ureters were catheterized 28 cm. with ease bilaterally and

FIG. 1. April 14, 1952, bilateral retrograde pyelograms showing deformity of the upper right calyx.

FIG. 2. April 26, 1952, recheck spot pyelograms of the right kidney demonstrating normal upper major calyx.

no residual urine found. Indigo carmine excretion was poor on the right and fair on the left. Five to ten white blood cells were present per high power field in the right ureteral specimen with no bacteria on gram stain. The left ureteral specimen was normal. X-rays revealed a typical horseshoe kidney configuration with a considerable filling defect in the right upper major calyx. (Fig. 1.)

It was believed that the filling defect in the upper major calyx might be significant of neoplasm or blood clot, and recheck pyelograms in ten days were advised. During that time she was given sulfonamides plus vitamin A, 5,000 units daily, plus vitamin C, 50 mg. daily. On April 26, 1952, she reported no interval bleeding, less abdominal discomfort and more energy, and a recheck retrograde pyelogram (Fig. 2) failed to reveal the previously noted filling defect. Gram stain of the sediment of the right kidney revealed no pus cells or bacteria, and she was released on the same medications to return in one month.

However, on May 18, 1952, she returned with severe disabling hematuria and right renal colic of twenty-four hours' duration and was hospitalized immediately. She was cystoscoped shortly after admission and a large volume of clotted blood evacuated from her bladder. Inspection revealed a fair-sized clot protruding from the right ureteral orifice and active bleeding around the clot. A catheter was passed to the right kidney which was irrigated with silver nitrate, 1 to 1,000. There was no change in her general physical examination. Her blood count on admission was: hemoglobin 78.9 per cent; red blood cells 4.4 million; white blood cells 12,100 with 77 per cent polymorphonuclears. In twenty-four hours the hemoglobin had dropped to 70.4 per cent with 3.5 million red blood cells. Coagulation time, 5 minutes 30 seconds; bleeding time, 3 minutes (normal by these methods); nonprotein nitrogen 36.5 mg. per cent; Wassermann test negative. On bedrest and sedation her bleeding ceased, and after four days recheck intravenous pyelograms and retrograde pyelograms revealed no change from the previous films. At this time because of disabling hemorrhage she was advised the removal of the right

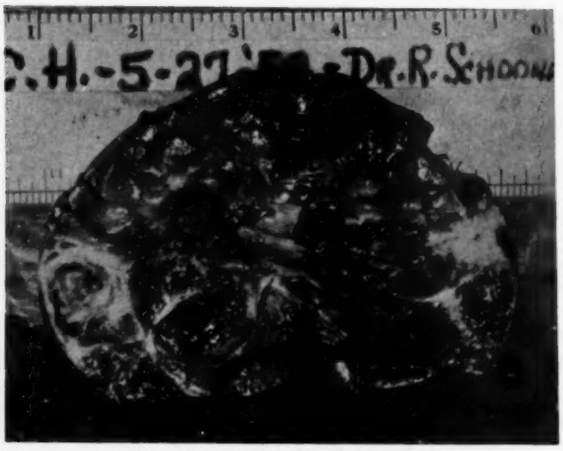

FIG. 3. Sectioned right half of horseshoe complex showing central half replaced by neoplasm.

half of her kidney complex, which was done on her tenth hospital day.

The right renal mass was removed through an oblique lumbar incision through the bed of the twelfth rib. The isthmus was ligated with a cobbler's stitch and its stump closed over oxycel.

The operative procedure was well tolerated, and her blood loss was compensated with a transfusion of 1,000 cc. of blood. Her maximum temperature on the third postoperative day was 103°F. It reached normal on the fifth postoperative day and she was discharged on her eleventh postoperative day.

The pathologic report was as follows: "Lab. No. X-52-1582. The specimen consists of a somewhat enlarged kidney, the center portion of which is replaced by a neoplasm measuring approximately 5 cm. in diameter. (Fig. 3.) The lesion is well circumscribed. Sections of the neoplasm show it to be composed of closely packed masses of malignant glandular epithelial cells with decidedly clear cytoplasm. There are large areas of hemorrhage and congested blood vessels. Many of the malignant areas are separated into lobules by rather dense, partially hyalinized fibroblastic tissue. In areas there is invasion into the adjacent kidney parenchyma. Small foci of necrosis are present. The histologic picture is that of a hypernephroma. The adjacent kidney tissue shows small foci of chronic inflammation but otherwise no abnormalities are seen. Diagnosis: Adenocarcinoma of kidney (hypernephroma)."

Over the period of the next six months she gradually lost her preoperative epigastric distress so that she was able to do her housework without discomfort and to extend her back without limitation. There was no further hematuria. Her first chest x-ray at the end of three months was completely free of any pathologic disorder. At six months the left half of the kidney complex was easily palpable and not tender, and there was no evidence of wound or flank induration. At ten months the patient had gained 5 pounds in weight and had no discomfort in the abdomen and no recurrence of hematuria. X-ray examination of the chest and lumbar spine failed to reveal any evidence of neoplastic disease. Her hemoglobin was 13.4 gm. per cent and red blood cells 4.79 million.

COMMENT

The horseshoe kidney is an easily recognizable entity and has been reported as subject to other pathologic changes such as obstructive uropathy, stones and infection in up to 70 per cent of cases. The "normal" distortion of the collecting system in this disease makes a diagnosis of a superimposed space-occupying lesion additionally difficult, and in the review of our films postoperatively we were unable to discover any alteration in the calyceal system which would lead us to the diagnosis in a subsequent similar case. The same difficulty might be encountered in neoplastic diseases associated with ectopia and polycystic renal disease. The indication for exploration in this case was based on the persistent hematuria which had reached the point of dangerous hemorrhage coupled with the background of conscientious investigations by preceding urologists. The decision to remove the offending half of the renal complex was explained to the patient as justified by her increasing blood loss and the rule that hematuria may mean neoplasm.

SUMMARY

Hematuria of unilateral upper tract origin, with an adequate contralateral organ, may be an indication for nephrectomy when all other diagnostic means have been exhausted without arriving at a concrete diagnosis. When such conditions have been met, surgery should not be delayed. A case of unilateral hematuria due to a renal cell adenocarcinoma occurring in a horseshoe kidney has been presented.

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SARCOMA INVOLVING THE SPLEEN*

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PRIMARY sarcoma of the spleen is relatively rare, approximately 195 cases having been reported in the literature.[1] The vast majority of these are of lymphomatous origin consisting of lymphosarcoma, reticulum cell sarcoma and Hodgkin's sarcoma. Other types such as angiosarcoma, fibrosarcoma and myosarcoma have been described but are extremely uncommon.[2,3]

Since many of the cases reported as primary sarcoma of the spleen represent a local manifestation of a generalized disease, it is difficult to accept them as authentic examples of primary malignancy.[4–6] Splenomegaly may be the only objective finding, but in most cases generalized reticuloendothelial system involvement is present although undetected when the splenic tumor is first observed. This is borne out by the early and widespread metastatic dissemination which has occurred in the reported cases and in those which we have observed.[7,8] We believe that these splenic tumors of reticuloendothelial origin should be referred to as "sarcomas primarily involving the spleen" and their generalized nature should be kept in mind.

Six cases are presented in which a tumor of the reticuloendothelial system was manifested by splenic involvement. The clinical syndromes are typical of those reported in the literature as characteristic of primary sarcoma of the spleen. In all cases generalized disease was present at the time of operation or appeared shortly thereafter; and although the local symptoms due to splenic involvement were successfully treated, the patients eventually succumbed to widespread disease.

CASE REPORTS

CASE I. M. K., a sixty year old white woman, was admitted with a chief complaint of intermittent stabbing pain in the left side intensified by movement. This was associated with a recent weight loss of 21 pounds. Examination revealed left pleural effusion and a large, firm, slightly tender mass in the left upper quadrant. There was no peripheral lymphadenopathy. The mass was outlined by flat plate, barium series and pneumoperitoneum. Thoracentesis was productive of 1,300 cc. of serosanguineous fluid which contained no tumor cells.

Exploration through a thoracoabdominal incision revealed a spleen tremendously enlarged by tumor growth which infiltrated through the diaphragm into the pleural cavity. The condition was deemed inoperable and a biopsy was taken. Microscopic examination revealed reticulum cell sarcoma.

Convalescence was uneventful. Palliative radiation was administered postoperatively, 2,450 r being delivered to the center of the spleen, following which the organ could no longer be felt. Therapy was discontinued when leukopenia supervened. During irradiation the patient's condition improved considerably. However, the improvement was short-lived and she died three months after operation.

Autopsy revealed diffuse tumor involvement of the peritoneum, pleura and pericardium, the gastrointestinal tract, lungs, liver, adrenals, kidneys, ureter, bladder, ovaries, thyroid and peripheral and visceral lymph nodes. Microscopic examination of the tumor tissue showed reticulum cell sarcoma similar in appearance to that of the biopsy. No tumor cells were found in repeated sections of the spleen from which the original biopsy had been taken. (Fig. 1.)

CASE II. B. K., a fifty-four year old white woman, was admitted with a chief complaint of irregular fever of two weeks' duration. She had also noted chest pain of one week's duration radiating to the left shoulder and aggravated by deep breathing. Examination revealed a chronically ill middle-aged woman with a fever of 102°F. No peripheral lymphadenopathy was noted. Hemoglobin was 68 per cent, red

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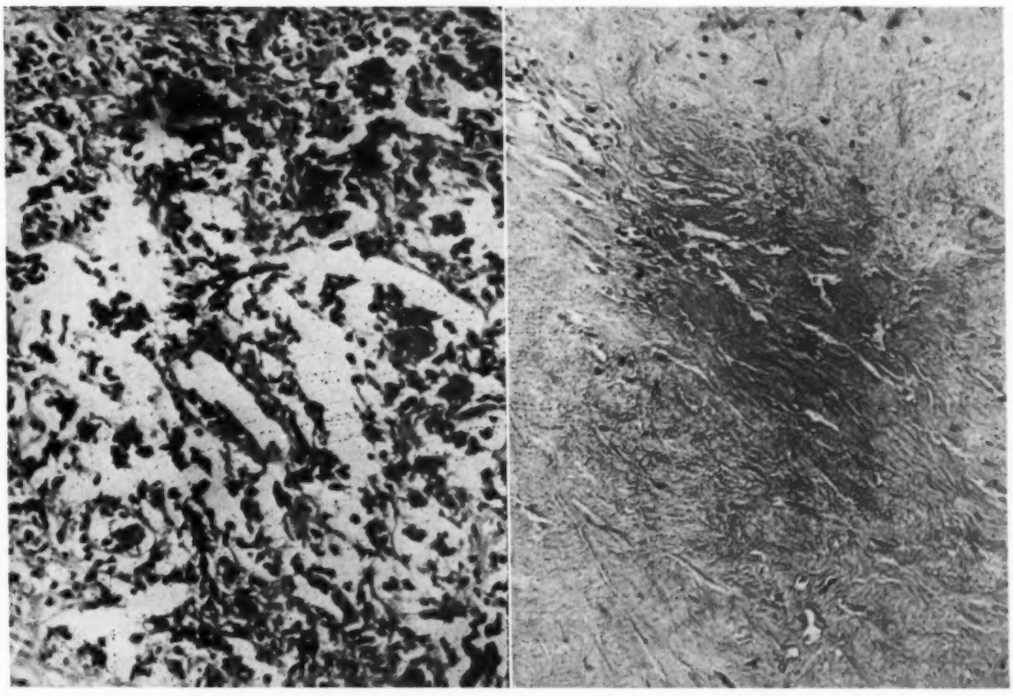

1A 1B

FIG. 1. Case 1. A, the biopsy of splenic tumor revealed reticulum cell sarcoma with many mitotic figures; B, section of the same spleen following x-ray therapy. There is no residual tumor within the spleen but the patient died from widespread metastatic lesions.

blood cells 3.8 million and white blood cells 18,200 with a normal differential.

Despite intensive antibiotic therapy, fever and pain continued. On the sixth hospital day the spleen became palpable for the first time and in the ensuing week it enlarged rapidly to 7.0 cm. below the costal margin.

After correction of the anemia with repeated transfusions, exploration was undertaken through a left thoracoabdominal incision. The spleen was markedly enlarged by a necrotic ulcerating tumor extending through the pulp and invading the splenic hilus, the tail of the pancreas and a portion of the left crus of the diaphragm, all of which were resected *en bloc*. On pathologic examination the tumor was found to be a reticulum cell sarcoma. (Fig. 2.)

Operation and convalescence were uneventful. Postoperatively the patient was treated with x-ray therapy and cortisone, which were followed by striking but transient improvement, and nitrogen mustard which had no effect. The patient soon became refractory to all therapeutic measures. Peripheral lymphadenopathy appeared, pain increased, the fever became high and spiking, and her condition deteriorated. She died seven months after operation.

CASE III. R. S., a sixty year old white diabetic housewife, was admitted with the complaints of pain in the left flank and fever. Seven years prior to admission, following the onset of increasing jaundice, cholecystoduodenostomy was performed elsewhere when a mass was found in the head of the pancreas obstructing the common duct. No biopsy was taken. The spleen at that time was noted to be three times normal size. The patient was well until two months before the present admission when fever developed and she had pain in the region of the left flank and left costal margin which was intensified by deep inspiration and cough. This was associated with anorexia, weakness and a 10 pound weight loss.

Examination revealed a temperature of 101.2°F., a non-tender palpable liver 5.0 cm. below the costal margin, and a markedly enlarged, tender, nodular spleen 12 cm. below the costal margin. There was no peripheral lymphadenopathy. Blood agglutinations and cultures were negative. The enlarged spleen was outlined on flat plate and barium series.

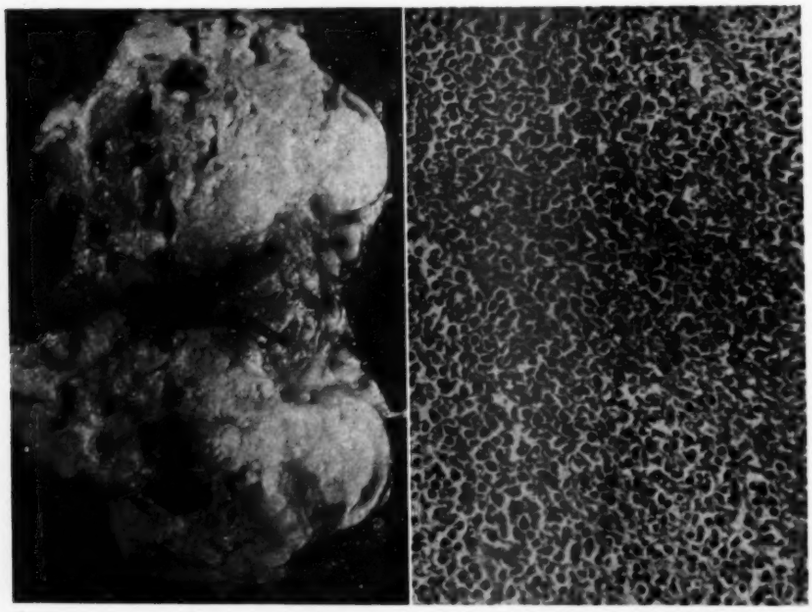

FIG. 2. Case II. Gross and microscopic appearance of reticulum cell sarcoma of spleen.

While under observation the patient ran a low grade febrile course. Splenic tumor was considered to be the cause of the symptomatology and laparotomy was elected. At operation the spleen was seen to be tremendously enlarged and studded with numerous irregular yellow nodules invading the hilus. No pancreatic abnormalities were noted. Splenectomy was performed. Microscopic examination revealed lymphosarcoma of the spleen. (Fig. 3.)

Convalescence was mildly febrile but otherwise uneventful and the patient was discharged on the fourteenth postoperative day. Radiotherapy was administered on an outpatient basis following discharge, but her condition deteriorated and she died six months after operation.

CASE IV. S. R., a sixty-six year old white diabetic housewife, was admitted complaining of a sticking pain in the left lower chest and hypochondrium radiating to the left flank and aggravated by deep inspiration. This was of two month's duration and was associated with anorexia, nausea and weight loss of 4 pounds. X-rays elsewhere had revealed left pleural effusion and the patient was admitted with a provisional diagnosis of lung tumor. Examination confirmed the presence of left pleural effusion, but a tender left upper quadrant mass extending 6.0 cm. below the left costal margin was noted. There was no peripheral lymphadenopathy.

While under observation the patient ran a febrile course between 100° and 102°F., not responding to antibiotic therapy. Fluid removed from the left pleural cavity contained no tumor cells. During the course of observation ascites developed.

The preoperative diagnosis of sarcoma of the spleen was made and splenectomy was performed through a thoracoabdominal incision. The spleen was tremendously enlarged by a necrotic cystic tumor mass infiltrating from the spleen through the diaphragm and appearing on the pleural surface of the diaphragm in the form of large nodular masses. The growth infiltrated into the posterior parietes and into the tail of the pancreas, and a small portion was adherent to the stomach. Palliative splenectomy was performed to improve the results of radiotherapy. Microscopic examination revealed lymphosarcoma. (Fig. 4.)

Convalescence was uneventful although the febrile course continued. The patient was discharged in good condition on the thirteenth postoperative day and given radiotherapy as an outpatient. She died three months after operation from widespread metastatic involvement.

CASE V. T. K., a forty-two year old white man, was admitted because of persistent unexplained low grade fever ranging to 102°F. The pyrexia was of five months' duration and was associated with a weight loss of 20 pounds,

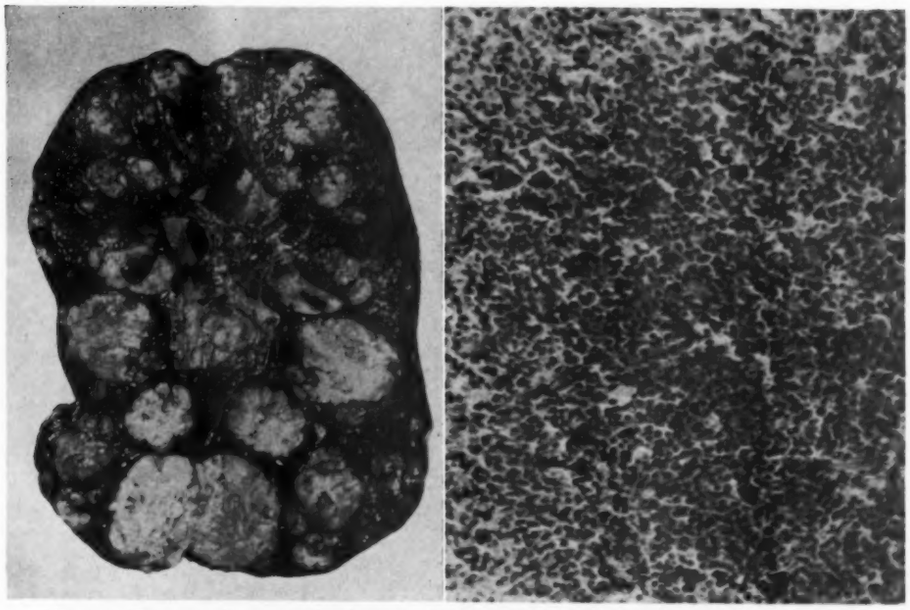

FIG. 3. Case III. Gross and microscopic appearance of lymphosarcoma of spleen.

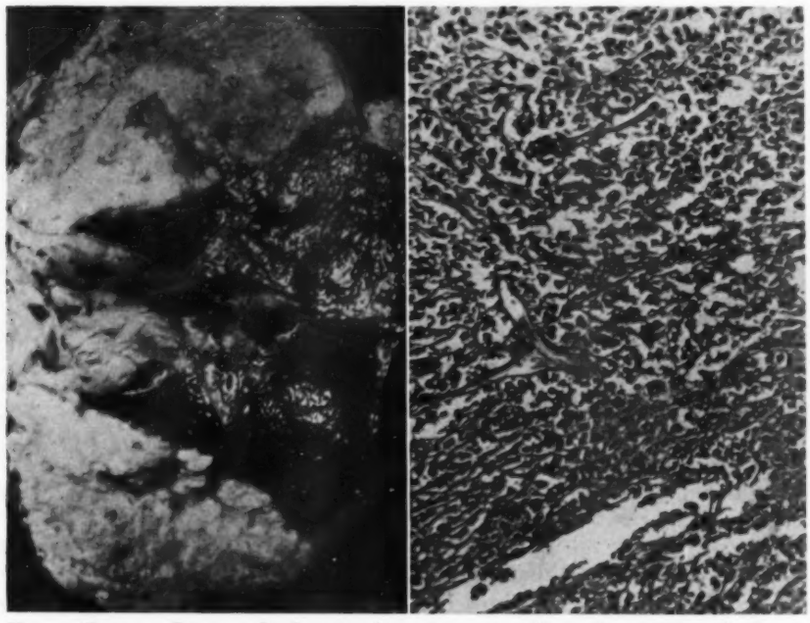

FIG. 4. Case IV. Gross and microscopic appearance of lymphosarcoma of spleen.

anorexia, night sweats, weakness and lassitude. Antibiotic therapy prior to admission had not affected the symptoms. Examination revealed a chronically ill male with a temperature of 100.2°F. There was no peripheral adenopathy; the lungs were clear and the heart normal. The liver was enlarged to 6.0 cm. below the costal margin. A tender left upper quadrant mass, presumably spleen, was palpable 4.0 cm. below the costal margin. Anemia was present, with hemoglobin 10.2 gm. and red blood cells 3.6 million. The white blood count was 15,600. Needle biopsy of the liver showed normal architecture. During the period of observation the patient ran a febrile course, the temperature ranging between 100° and 101°F. The diagnosis of sarcoma of the spleen was made preoperatively, and laparotomy elected. At operation a tumor mass was found involving the spleen and infiltrating through the splenic hilus into the

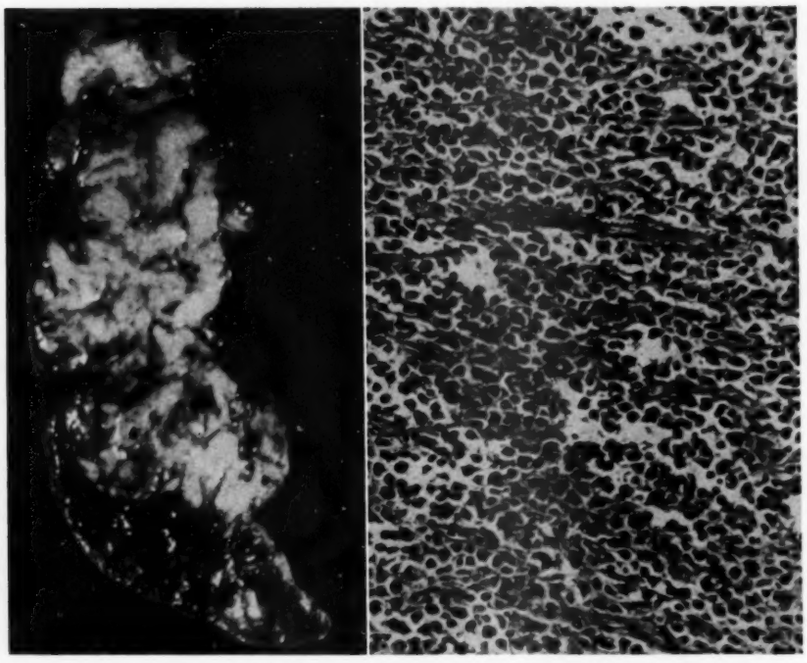

FIG. 5. Case v. Gross and microscopic appearance of reticulum cell sarcoma of spleen.

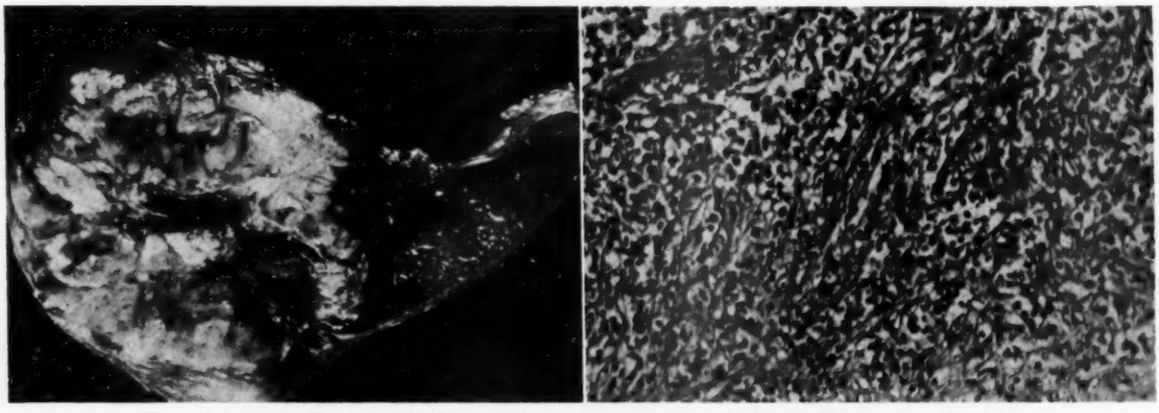

FIG. 6. Case vi. Gross and microscopic appearance of reticulum cell sarcoma of spleen.

tail of the pancreas. Splenectomy was performed with resection of the tail of the pancreas. The pathologic report revealed reticulum cell sarcoma of the spleen. (Fig. 5.) Postoperative convalescence was completely uneventful. When last seen seven months after operation the patient was alive and well.

CASE VI. B. R., a sixty-three year old white woman, was admitted with the complaint of severe, sharp, "tearing" left upper quadrant abdominal pain of two months' duration associated with a three-day episode of hematemesis and melena three weeks prior to admission. She also complained of anorexia, nausea, dizziness and weakness, and had lost 18 pounds in the two months since the onset of symptoms. Physical examination revealed tenderness and muscle spasm in the left upper quadrant of the abdomen, and the spleen was palpable 1.0 cm. below the costal margin. The liver was enlarged 8.0 cm. below the costal margin. There was no peripheral lymphadenopathy. Hemoglobin was 9.7 gm. and the red blood count was 3,450,000. Gastrointestinal series was interpreted as revealing a mass in the fundus of the stomach extending into the lumen on its posterior and superior aspects, with an irregular polypoid or eroded surface. Plain film of the abdomen confirmed the presence of splenic enlargement. Chest x-ray was negative.

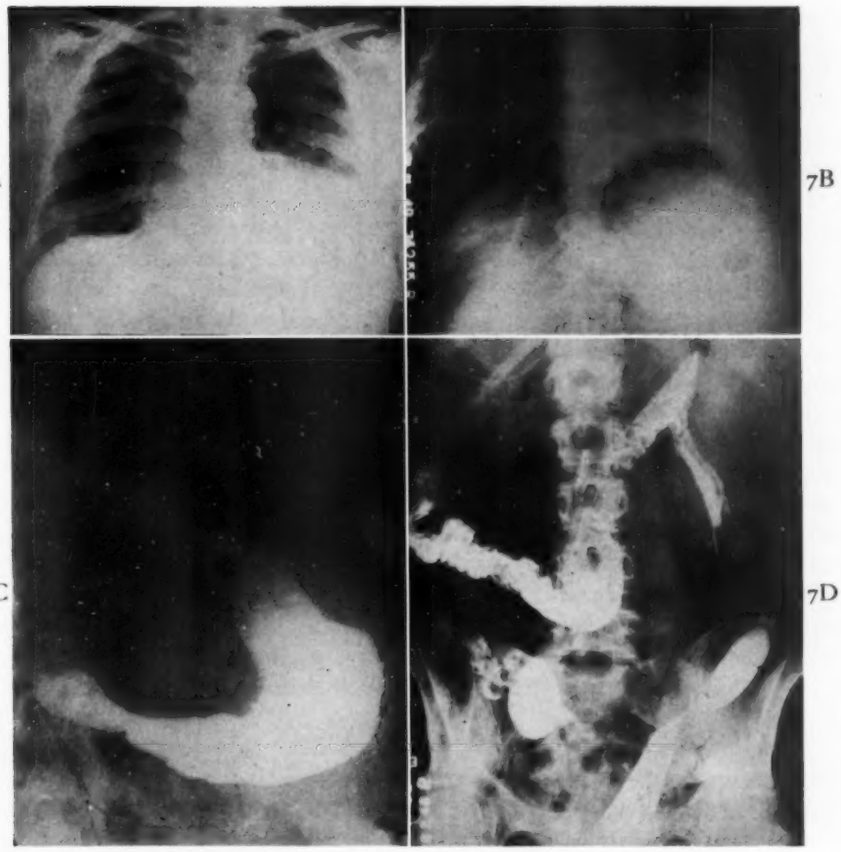

FIG. 7. X-ray manifestations of splenic sarcoma. A, left-sided pleural effusion; B, splenic tumor outlined by pneumoperitoneum; C, filling cavity in stomach produced by splenic tumor; D, displacement of splenic flexure of colon due to splenic tumor.

The impression was that the patient had carcinoma of the stomach although the possibility of sarcoma of the spleen was considered. At operation a large non-resectable tumor of the upper pole of the spleen was found, with extensive invasion of surrounding structures including diaphragm, cardia of the stomach and posterior parietes, and the incision was closed following splenic biopsy. Pathologic examination of the biopsy revealed reticulum cell sarcoma. (Fig. 6.) Postoperative convalescence was uneventful. However, despite radiation therapy the patient's condition deteriorated and she died six months after operation.

COMMENTS

These cases illustrate the typical findings which have been reported in primary sarcoma of the spleen. The initial manifestations are usually pain in the left upper quadrant of the abdomen, frequently radiating to the left shoulder, and a palpable mass in the left upper quadrant. Fever, loss of weight, anemia and general debility are prominent symptoms and in the later stages ascites and pleural effusion may be present. Infrequently the first manifestations may be gastrointestinal hemorrhage or splenic rupture, and rarely colonic obstruction. The presence of a splenic mass can be confirmed by flat plate, barium series and pneumoperitoneum (Fig. 7), but in most cases laparotomy is essential to clarify the diagnosis and obtain material for biopsy.

Splenic resection is indicated where possible for several reasons. In rare instances the sarcoma may be truly primary and confined to the spleen. In the usual case palliation and prolongation of life may be accomplished by elimination of the focus of the disease from which the major manifestations are occurring. Splenectomy may be expected to improve the results of radiation by eliminating the main source of extensive postradiation necrosis and

allowing greater radiation dosage elsewhere. These are the theoretic advantages. In our experience splenectomy has not appreciably altered the course of the disease.

The best surgical approach for splenectomy in these cases is through a left thoracoabdominal incision. This method gives superior exposure and permits removal of adjacent organs involved by local extension.

Every patient should receive judicious radiation therapy postoperatively. On occasion x-ray therapy may be used before surgery to improve resectability. The effects of radiation are varied and at times may produce prolonged palliation and even complete disappearance of the tumor. Sooner or later, however, the lesion recurs in a refractory form and the ultimate prognosis is extremely poor.

Nitrogen mustard, ACTH and radioactive phosphorus (P-32) were of no benefit in any of these cases and would seem to have little place in the therapy of this condition.

SUMMARY

1. The entity of primary sarcoma of the spleen as reported in the literature is open to serious criticism. The term should be confined to the rare tumors arising from the supporting tissues of the spleen. The tumors of reticuloendothelial origin represent a local manifestation of a generalized disease and should be referred to as sarcomas primarily involving the spleen.

2. Sarcoma of the spleen is a recognizable clinical entity characterized by a mass in the left upper quadrant, abdominal pain, fever, anemia and debility. Pleural effusion may be present due to involvement of the diaphragm. Direct invasion of the stomach may give rise to gastrointestinal bleeding.

3. Treatment includes surgical removal of the local mass and radiation therapy. The prognosis is poor but palliation may be obtained.

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CHOLECYSTECTOMY AND SPHINCTEROTOMY FOR BILIARY DYSKINESIA

A CLINICAL ATTEMPT TO DEFINE THE INDICATIONS

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A RECENT article[1] sums up the literature on cholecystectomy by stating that good results will be as high as 95 per cent in typical cases of stones in the gallbladder with gallbladder colic. Cholecystectomy for conditions without stones and without pain will give good results in only 60 per cent. Inability to visualize the gallbladder indicates that gallbladder disease is present, but cure of the symptoms may not result because the symptoms may have been due to other causes. On the other hand 2 to 3 per cent of the patients having symptoms of acute gallbladder disease will be relieved by cholecystectomy although cholecystography reveals a normal shadow. From the above it is evident that a variable percentage of patients will show gallbladder symptoms following cholecystectomy (5 to 40 per cent). This is referred to as the post-cholecystectomy syndrome.

Cole and Grove[1] mention erroneous diagnosis, stones in the common duct, chronic pancreatitis, large cystic duct stump, anomalies, biliary dyskinesia, neuromas and psychoneurosis as being the factors causing this syndrome. The treatment after cholecystectomy is self-evident according to the foregoing and aside from biliary dyskinesia is not relevant to this paper.

It is my purpose to discuss the surgical treatment of cases which are clinically typical of gallbladder disease and which do not have stones present on cholecystography. As stated previously the results are only 60 per cent favorable following cholecystectomy. It is this group which in a general way may be classified as biliary dyskinesia. Cholecystography usually shows a normal or poorly functioning gallbladder often despite typical attacks of acute colic. The decision to remove the gallbladder is a serious one, knowing that poor results will follow in 40 per cent. As mentioned previously a careful differential diagnosis is necessary because of the varying number of conditions which may simulate gallbladder disease. Excluding those failures following cholecystectomy which are due to incomplete or faulty surgery, chronic pancreatitis, psychoneurosis and biliary dyskinesia remain. Another cause for this condition has been recently mentioned as being an enlarged lymph gland or lymph glands at or about the head of the pancreas. A recent article[5] reports cure by removing these but I have had no experience with this and find no other literature on the subject. In the cases reported tuberculosis was a common etiologic factor.

Chronic pancreatitis is a condition which is practically impossible to differentiate from biliary dyskinesia. Even at surgery the condition must be far advanced before the diagnosis is evident. The presence of an elevated blood amylase or lipase is valuable but is not found in the borderline cases. The exact relationship between gallbladder disease and pancreatitis is still being debated although the presence of both conditions at the same time is quite common.

The presence of anomalies of the ampulla of Vater[1] and fibrosis or strictures of the sphincter of Oddi[10] can only be determined at the time of surgery and a diagnosis of any of these conditions prior to operation would be questionable. The use of cholangiography at the time of surgery may demonstrate these.

Spasm of the sphincter of Oddi is another diagnosis which cannot be proved preoperatively. The possibility of allergy as a cause has been recently reported by Jennings and his associates.[7] It is this general group which is often diagnosed psychoneurosis and it is in this group that I believe definitive surgery must be attempted before the high percentage of failure following cholecystectomy can be improved. Heretofore at the insistance of either the internist or the patient the surgeon has per-

formed cholecystectomy as a last resort, with the hope that he will either find some other cause for the symptoms or that the patient will be improved for psychic reasons. These patients are often reoperated upon and are always treated medically from then on, and an opportunity for possible cure by surgery has been missed.

The use of sphincterotomy was first introduced by Archibald in 1913 for pancreatitis and has been recently popularized by Doubilet.[3] It is at present being used frequently throughout the country. It is also recommended for spasm or stricture as demonstrated by cholangiography at the time of surgery and gives promise of further cutting down the number of poor results following cholecystectomy. While not an innocuous procedure in the hands of a capable surgeon it should carry very little if any increase in morbidity or mortality; especially since it is used only in those cases which show no acute pathologic condition.

Section of the sphincter of Oddi was done originally through the duodenum by Archibald[3] and this method is being used by most surgeons at this time. Doubilet[3] has a special instrument which he passes through the common duct into the duodenum and then cuts the sphincter in a somewhat similar manner to an internal urethrotomy. I have never tried this instrument and most writers seem to think that an exposure of the ampulla and section under direct vision is preferable. My own technic is similar to that used by many others and is simple and very satisfactory. A routine paracostal incision and exposure and freeing up of the gallbladder as explained elsewhere is done.[11] The duodenum and the head of the pancreas are then freed up by incising the lateral peritoneal border and by pushing them gently away from the retroperitoneal tissues. The head of the pancreas and the common duct are carefully palpated for stones and other abnomalities. The use of cholangiography is indicated at this point but I have not used it for determining spasm or stricture of the sphincter to date. The common duct is now opened by a longitudinal incision just above the duodenal curve. In view of the fact that about 14 per cent of cystic ducts join the common duct behind the duodenum[6] it seems logical to go as low as possible in order that the common duct is entered in most cases below this point. With the left hand grasping the head of the pancreas between the first fingers and thumb a grooved director is passed through the common duct into the duodenum. Any irregularities or difficulties in passing the probe can be noted by this method which also insures that the probe is not jammed through the wall. Prior to passing the probe the common duct is flushed out with saline and the returns carefully noted for debris and tiny stones. The probe is now pushed forward until it presses against the anterior duodenal wall. Incision in the duodenum is done about an inch or more above this point. The end of the grooved director is now grasped with a hemostat and the pancreas and common duct are thus elevated causing the mucous membrane about the ampulla to be raised and outlining the sphincter. This area is cut with a knife for about ¼ to ½ inch until one is sure the muscle and the end of the duct are severed.

I have not been able to define exactly the muscle bundle in cutting the sphincter as can be done in pyloroplasty and have been unable to find any references in the anatomy textbooks which would indicate that the muscle fibres are of sufficient size or firmness so that they may be determined as such grossly. In cutting the sphincter I have cut upward for approximately ¼ to ½ inch until there was a sense of fibrous resistance and a white fibrous tissue was apparent grossly. I have taken this fibrous tissue to be the end of the common duct. The histologic[9] and anatomic relationships would indicate that this was so. In view of the relationship between the terminal portion of the common duct and the wall of the duodenum anteriorly in this area such a procedure is safe and insures that the cut edges will not grow together.[3] I have had no difficulty with bleeding and in the few cases reported hereinafter have not had to tie off any vessels. In one case I used gelfoam to control the oozing. A urethral catheter (No. 10–12) with an additional one or two holes is now inserted into the common duct and sewed in place. The duodenum is then closed transversely with an inner Connell stitch of chromic catgut (No. 00) followed by a seromuscular stitch of interrupted silk. The gallbladder is now removed following which the wound is closed with a rubber tissue drain placed down to the foramen of Winslow. The drain and catheter are let out through a stab wound. The question of whether to place the tube or catheter through the sphincter into the duodenum is debatable.

Lahey[8] inserts a long T-tube into the duodenum and leaves it for from three to six months. Doubilet[3,4] and Cole[1] drain the common duct only and use drainage for from two to three weeks. It is my custom to do a cholangiogram when the wound is healed and dry (approximately seven to ten days postoperatively); and when the dye is seen entering the duodenum without difficulty and the biliary system is normal, the catheter is removed. It is of interest in this regard that experimental work on splinting of the ureter following resections in animals seems to show that the optimum time for withdrawal of the splint is only from three to four weeks.

Lahey[8] has recently invented a split rubber catheter which sounds very promising in outlining the sphincter of Oddi and making its section more easily and accurately done.

According to Doubilet[4] "the function of the sphincter of Oddi is to increase the resistance of the flow of bile into the duodenum to an extent just sufficient to fill the gall bladder. In animals, destruction of the sphincter causes complete loss of function of the gall bladder. It ceases to fill and therefore to empty and becomes a collapsed flaccid diverticulum." Therefore, sphincterotomy should always be accompanied with removal of the gallbladder.

CASE REPORTS

CASE I. This forty-eight year old woman was admitted for repeated attacks of acute gallbladder colic of seven years' duration. These had become increasingly severe requiring hypodermics for pain. There was a history of marked fatty intolerance. Repeated gallbladder visualizations were negative. The question of non-visualizing stone was considered. The patient had refused operation repeatedly and finally agreed only because the attacks were so severe and so frequent. Physical examination was essentially negative except for extreme obesity. There was no soreness over the gallbladder area and no masses were felt. In the discussion it was decided beforehand that a sphincterotomy would be done unless definite reasons for the attacks were found. Electrocardiogram was negative. At operation on March 28, 1951, a large, thin-walled gallbladder was found which was adherent to the hepatic flexure. This was freed up and the gallbladder, cystic duct and the common duct carefully examined. The common duct was not dilated and no stones were noted. There was an enlarged lymph gland at the head of the pancreas. The gallbladder was freed up and the cystic artery located and cut, following which the common duct was opened and a grooved director was passed into the duodenum without difficulty after freeing up the head of the pancreas. The duodenum was opened and a sphincterotomy was performed. (Figs. 1 and 2.) A No. 12 catheter was inserted into the common duct and led out a stab wound. Convalescence was uneventful. The drainage from the catheter was profuse the first three days and then gradually decreased. On the tenth day a cholangiogram showed no obstruction to the dye. The tube which had been intermittently clamped was removed the following day. The patient was discharged on April 12th, the fourteenth postoperative day, completely healed and dry, and has been completely well to date.

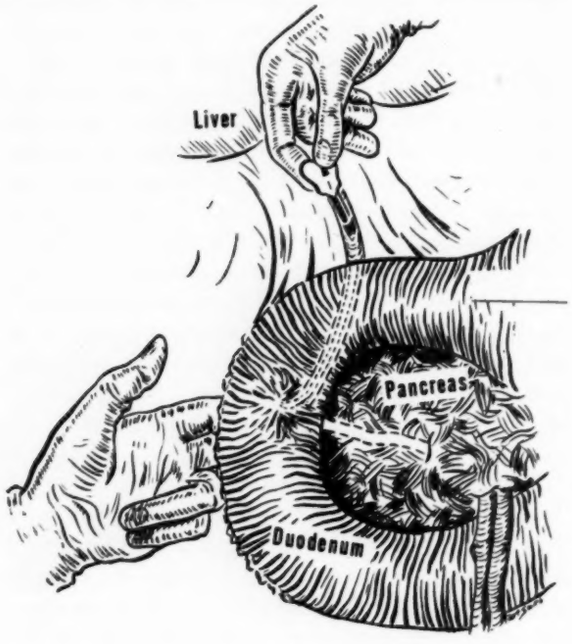
All gallbladder cases are put on a low fat diet for the first year after surgery and this may account to a certain extent for the improvement. However, the patient has had no attacks of pain and only slight symptoms of fat indigestion since resumption of normal eating habits. She believes that her operation is a complete success.

CASE II. This forty-five year old man was a chronic alcoholic who had had repeated admissions to the hospital for acute abdominal pain which had been diagnosed as acute recurrent pancreatitis. No definite tests such as the secretin test had been done but the blood studies showed a serum lipase of 540. The serum amylase was normal. The question of whether this was a chronic gastritis was also entertained. The patients attacks had been so severe however that pancreatitis was considered to be the cause of the pain. Gallbladder visualization was normal. At operation on December 4, 1950, the gallbladder was dilated but was otherwise normal, as was the common duct. The pancreas was hard but not enlarged and there was no suggestion of malignancy. The gallbladder was removed and a transduodenal sphincterotomy was done. Moderate bleeding was controlled by gelfoam. Convalescence was uneventful and the patient was discharged on December 20th. He was re-admitted on one occasion for acute alcoholism with the same abdominal pain. In view of the chronic alcohol-

ism the result must be interpreted as being inconclusive but probably a failure.

CASE III. This forty-six year old woman was referred for sphincterotomy because of chronic fatty indigestion and right upper quadrant distress. She had never had acute gallbladder colic and her complaints were entirely subjective. She had been hospitalized and thoroughly studied for possible endocrine balance without a definite diagnosis being made. The psychic element was also prominent because of difficulties in the home. This patient was a short fat woman showing many of the physical characteristics of endocrine imbalance. At operation on January 22, 1952, a dilated gallbladder was found which was adherent to the hepatic flexure. Cholecystectomy and transduodenal sphincterotomy were performed, with drainage of the common duct. Examination of the specimen showed the presence of a tiny stone inbedded in the cystic duct. A postoperative cholangiogram showed free entrance of the dye into the bowel. The patient was discharged on February 10th, and one month postoperatively she stated that she felt completely well. In November, 1952, her attending physician stated that she had exactly the same complaints as those prior to surgery.

This case shows a patient who had a multitude of complaints, with those of questionable biliary dyskinesia the most prominent. There was no history of acute gallbladder colic or biliary distention, despite the presence of a small stone in the cystic duct. This case can be classified as a complete failure.



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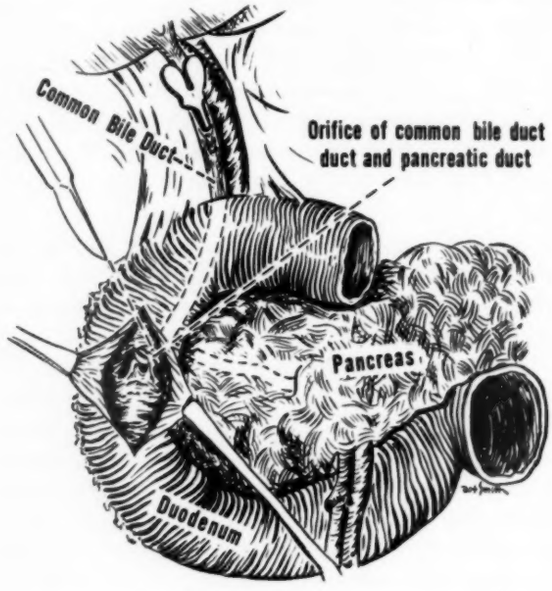

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FIG. 1. This shows the passing of the grooved director with the guidance of the fingers of the left hand which are shown behind the duodenum. In the illustration the end of the probe is seen projecting into the anterior wall directly over the ampulla. Actually the probe hits the anterior wall between 1 and 2 inches below this point. Incision is therefore made not at the point of bulging but an inch above it.

FIG. 2. This shows the duodenum opened and the probe projecting through the ampulla. The end of the probe is grasped with a hemostat elevating the mucous membrane and the sphincter, and outlining the part to be incised.

CASE IV. This fifty year old woman was admitted because of a chronic right upper quadrant distress and marked fatty indigestion. She had had a hysterectomy in 1947 and has been gradually losing weight and going downhill ever since. The patient had been thoroughly studied, including a complete gastrointestinal series and intravenous pyelograms. Gallbladder visualization was negative. Physical examination showed a thin, sick-looking individual who complained of aching in the right upper quadrant with some soreness to palpitation. All blood counts, urinalysis, etc., were normal. At operation on May 15, 1951, the gallbladder and common duct were grossly normal. Examina-

tion of the pancreas, right kidney and intestinal tract was negative. Cholecystectomy and transduodenal sphincterotomy were done. The convalescence was uneventful and the patient was discharged on May 26th.

This patient continued to complain and her general condition became worse. The intravenous pyelogram was repeated in November, 1951, and was reported normal. In January, 1952, she showed hematuria and a retrograde pyelogram revealed a tumor of the lower pole of the right kidney. A nephroureterectomy was done for a large tumor of the lower pole apparently of primary origin. The pathologic report was rhabdomyosarcoma. The patient died while in the hospital; autopsy was refused.

This case demonstrates surgery as a last resort in a very obscure and progressive condition showing symptoms of fatty indigestion and right upper quadrant distress or mild pain. Malignancy of the gallbladder was considered as a possibility preoperatively. Sphincterotomy was done as a routine procedure in the hope it might relieve the distress. In this patient the question of pyschoneurosis was also strongly entertained because of the absence of definite clinical disorder. The blood findings were normal and it was believed that her loss of weight was due to improper diet.

Case v. This nineteen year old girl was seen in my office in February, 1952, with a history of recurring attacks of right upper quadrant pain, knife-like in character, radiating to the back and shoulder, of two years' duration. These attacks had been occurring two or three times a week for the last month and were precipitated by eating. As a result she had practically stopped eating and had lost 15 pounds in weight. She noted that heavy greasy foods always caused an attack and she was nauseated at times but never vomited. She had received hypodermics for these attacks on several occasions. Bowel movements were normal and there were no urinary complaints or jaundice. Menstrual periods were perfectly normal and there was no relation between them and these attacks. The patient had had the usual childhood diseases and in 1948 her appendix was removed. This patient was a laundry worker and her mother thought that the work might be too hard for her. Emotionally she seemed fairly normal. She denied any difficulty either in her work or with the opposite sex. Her mother stated however that the patient rarely went out with boys. A gallbladder visualization done in December, 1951, was negative. Because of the negative gallbladder studies she had been diagnosed by several doctors as being nervous. Physical examination showed an attractive girl of nineteen who looked ill. There was constant muscle spasm and localized soreness over the gallbladder area; the rest of the abdomen was normal. At operation the gallbladder was thin-walled and grossly negative. Cholecystectomy and transduodenal sphincterotomy were performed on March 3, 1952. It was noted that the common duct was of such a small caliber that a No. 8 catheter was inserted with great difficulty. This was checked carefully in order to make sure that the duct used was not actually either the cystic or the right hepatic. On the first postoperative day the patient showed jaundice which was believed due to the fact that the small duct was completely blocked by the tube. The jaundice subsided in forty-eight hours following withdrawal of the tube from the duct. Aside from the expected profuse discharge of bile through the wound and around the tube, convalescence was uneventful. The patient was discharged on March 19th and returned to work in May. She was last seen in September, 1952, because of an attack of abdominal pain, vomiting and a bulging in the wound area. At this time no cause for the attack could be found except possible food indiscretion. The patient denied any emotional or psychic episode and stated that she had been working at the same job and had been perfectly well. A telephone check up December 1, 1952, showed her to be well.

Despite the denials in this case it is very probable that there are some underlying outside factors which precipitated the attacks. However, without any change in environment or habits, this patient has been completely well for eight months. The role of spasm, whatever the cause, must be the factor involved. The size of the common duct would preclude any serious obstruction of any great degree.

Case vi. This thirty year old white unmarried woman was seen at my office August 7, 1952, complaining of pain in the back and upper right quadrant with increasingly severe attacks of pain and vomiting. Fatty indigestion was marked and eating fatty food always precipitated an attack. The patient was a hospital employee and had been repeatedly admitted

for the pain and vomiting. The gallbladder and gastrointestinal studies were normal and she had been seen at one time by a psychiatrist who diagnosed her as psychoneurotic. She had lost 15 pounds in weight in the past two months but was still obese. Various medications and diet had been tried without success. Past history was negative except for an appendectomy in 1942. Physical examination was negative aside from some subjective pain over the gallbladder area. The gallbladder and common duct were grossly normal at surgery. On August 19th a routine cholecystectomy and sphincterotomy were done. Microscopic examination showed a mild chronic cholecystitis with cholesterol in the villi. The patient was discharged on September 3rd and returned to work on October 1, 1952. When last seen March 1, 1953, she stated that she was perfectly well and had been working steadily.

Clinically this patient is completely cured, although the duration is too short to be statistically valuable. It is of interest that the nurses who observed her during her attacks while at work all thought that she must have gallstones and now state that she is completely well.

COMMENTS

In presenting the case reports I have emphasized the lack of gross pathologic disorder in the biliary system and/or pancreas. The diagnosis of biliary dyskinesia is still controversial and therefore any organic cause for the symptoms must be completely ruled out before this is acceptable. In one case (Case III) a small stone was found in the cystic duct. The result in this patient was poor, demonstrating that her symptoms were due neither to the stone nor to sphincteric spasm. Case IV was misdiagnosed and the result was to be expected. Case II with a diagnosis of questionable pancreatitis secondary to chronic alcoholism is not pertinent to this report except as an indication that sphincterotomy is not always a cure for this condition.

The remaining cases fall into the category classed as biliary dyskinesia. All of the patients presented exactly the same history and all had had repeated medical trials and repeated cholecytograms which were normal. In two patients symptoms lasted two years and in one case, seven years. All of the patients had symptoms (1) which were typical of gallstone colic and which had been repeatedly so diagnosed by different physicians; (2) which recurred more and more frequently prior to surgery and which in each case were progressively severe; (3) which were so severe as to warrant the use of narcotics during the attacks; and (4) which were precipitated by eating fried or fatty foods. In all cases diet therapy alone was only of temporary if any benefit and the patients were reconciled to the necessity for surgery even though no assurance of cure was promised.

It is my belief that before sphincterotomy these cases would eventually have had an exploratory laparotomy with possible cholecystectomy and it is also my opinion that the results would have been poor as noted by Cole.[1] The excellent results in all three cases which fell within the narrow definition of biliary dyskinesia are too positive to be coincidental. The number of cases presented, however, is too small to warrant a final conclusion. Further trial is necessary before accepting cholecystectomy and sphincterotomy as the proper procedure in biliary dyskinesia.

While my cases had medical treatment for at least two years the time element may be able to be shortened but the diagnosis based on an exact and thorough history must be accurate. The syndrome and history presented in my three cases would seem to be a fair indication for surgery.

The use of cholangiograms at operation should be of great value in diagnosing this entity if the technic is adequate. In our hands the results have not been satisfactory.

SUMMARY

1. A brief résumé of the present status and use of section of the sphincter of Oddi is presented and a technic for doing the procedure outlined.

2. Five cases diagnosed biliary dyskinesia and one case diagnosed chronic recurrent pancreatitis have been treated by cholecystectomy and transduodenal sphincterotomy.

3. The results in those cases (three) showing the typical gallstone colic syndrome have been excellent to date. One case was misdiagnosed and one showed no improvement. The result in the pancreatitis case is obscured by chronic alcoholism but must be considered poor.

4. The conclusion seems warranted that cholecystectomy and sphincterotomy are indicated in cases of biliary dyskinesia with a

normal or questionable cholecystogram, showing the typical gallstone syndrome. Further trial must be done, however, before this conclusion becomes absolute. Great emphasis must be placed on a careful history and a thorough medical trial before surgery.

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A study of some recent statistics indicates that in the hands of the average surgeon the five-year survival rate in patients with gastric cancer (submitted to surgery) is equally good if only subtotal, instead of total, gastrectomy is performed. Almost all of these patients are greatly relieved by subtotal gastrectomy and survive for at least five years. In the hands of specially trained gastric surgeons, of course, a higher percentage of patients will be considered operable, and later a higher survival rate can be confidentially anticipated after total gastrectomy. (*Richard A. Leonardo, M.D.*)

Modern Operative Technics

No. 16

CONGENITAL ATRESIA OF THE ESOPHAGUS WITH TRACHEO-ESOPHAGEAL FISTULA*

A SIMPLIFIED METHOD OF RESTORING CONTINUITY OF THE ESOPHAGUS

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MALFORMATIONS of the esophagus are not common. Various estimates of their incidence range from one in 2,500 to one in 800 births. Whereas it is true that the average physician will see only a few such cases during his career, it is important that he should recognize the defects quickly when he encounters them. The surgeon who operates on these children should be familiar with the technic of esophageal repair as well as the postoperative care.

Congenital anomalies of the esophagus were first classified by Vogt[1] in 1929. However, many new types have been added since the advent of the modern treatment of the anomaly. Lanman[2] described variations and he also discussed methods of diagnosis and treatment. We[3] have previously added one type and are describing another variety in this paper. However, this by no means exhausts the entire category of variations which the malformation may exhibit. (Fig. 1.) Approximately 91 per cent of esophageal abnormalities consist of an atresia of the upper segment with tracheo-esophageal fistula of the lower.

DIAGNOSIS

The anomaly may be recognized and categorized as follows: (1) *Respiratory difficulty with feeding:* A baby who repeatedly strangles on his nutrition should be suspected of having an esophagus which either ends blindly or communicates with the trachea. The reason for strangling or choking is aspiration of food or water and its most common cause is either the direct entrance of foreign substance into the bronchial tree through a fistulous tract or regurgitation and then aspiration of the regurgitated material. (2) *Use of opaque media:* The use of barium, lipiodol and other opaque media are usually unnecessary. We believe that a scout film of the entire baby will disclose, first of all, the absence or presence of gas throughout the gastrointestinal tract. If, in addition, an opaque catheter is passed and does not go through into the stomach, it may be concluded that the anomaly is type 3*c* in which the upper portion of the esophagus ends blindly and the lower part communicates with the trachea or a main stem bronchus. If, however, there is no gas in the gastrointestinal tract and the same conditions prevail, it is probably the rare type 2. It is only in type 3*b* and 3*d* and their variations that our great difficulty in diagnosis occurs. Here the catheter passes into the stomach, there is gas in the alimentary canal and yet there is tracheobronchial aspiration of ingested food. In this type the use of opaque material such as lipiodol will be helpful. Type 3*a* presents no difficulty because there is no gas in the alimentary canal and the catheter is seen to enter the trachea or one of the major bronchi directly.

Therefore, all that is necessary to establish a diagnosis in about 95 per cent of esophageal malformations is the use of an opaque catheter and a scout film of the entire body of the newborn baby. (Fig. 2.) Whereas it may occasionally be important to use lipiodol it must be remembered that the injection of this substance

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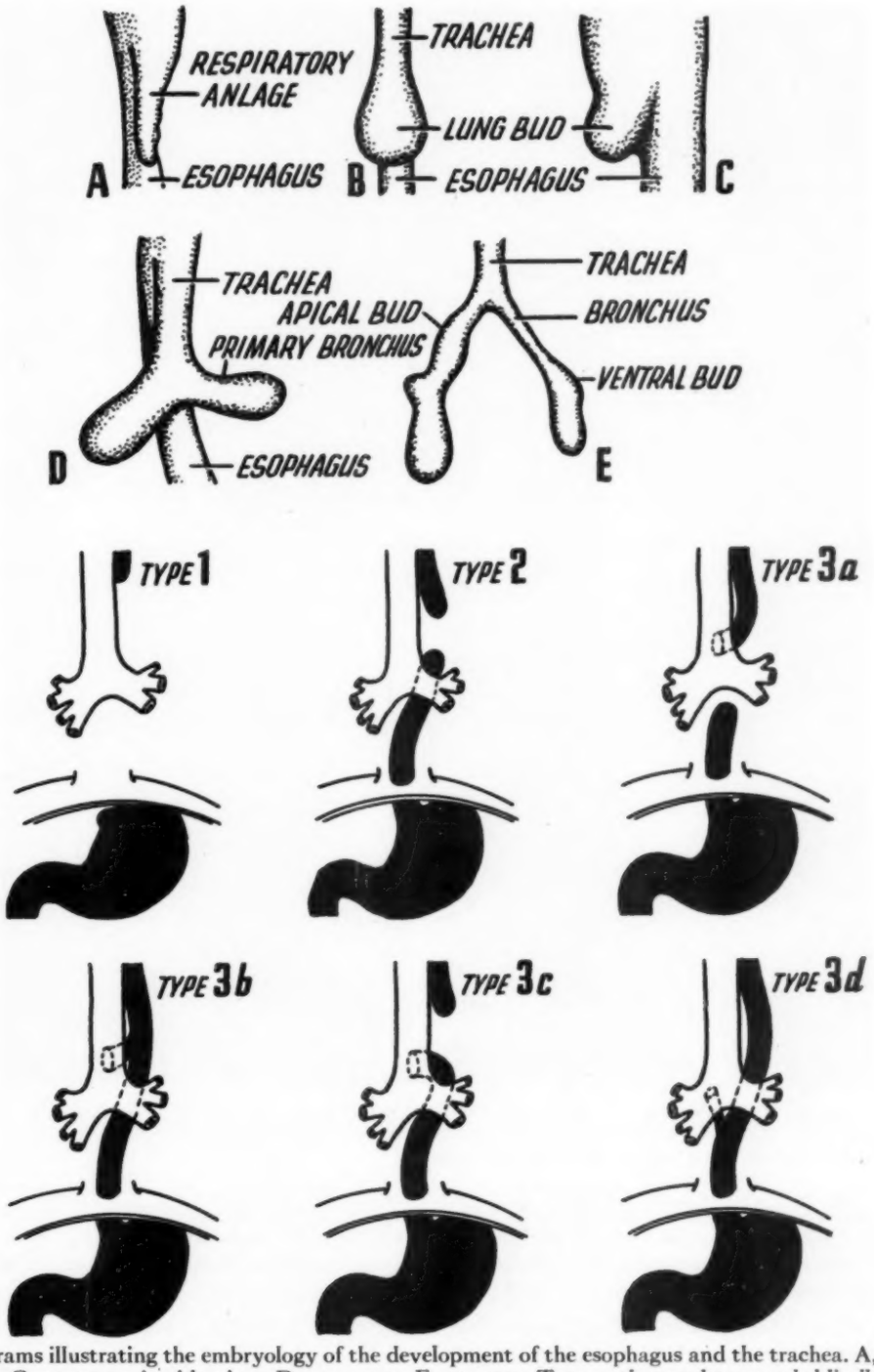

FIG. 1. Diagrams illustrating the embryology of the development of the esophagus and the trachea. A, at 2½ mm.; B, at 4 mm.; C, at 4 mm. in side view; D, at 5 mm.; E, at 7 mm. Type 1, the esophagus ends blindly and there is no distal end of the esophagus; the cardiac end of the stomach is also atretic. Type 2, the upper and lower ends of the esophagus are present; however, they are both blind and there is a short distance between them. Type 3*a*, the upper end of the esophagus communicates with the trachea. The lower end of the esophagus is blind. Type 3*b*, the upper and lower ends of the esophagus are in continuity; however, there is a tracheo-esophageal fistula. Type 3*c*, the upper end of the esophagus is blind; the lower end communicates with the trachea close to its bifurcation. This is by far the more common variety. Type 3*d*, a variation of type 3*b* which we have encountered showing the esophagus to be continuous, but there is a tracheo-esophageal fistula low down in the esophagus.

FIG. 2. Infant D. W., age thirty-six hours (St. Vincent's Hospital). Left, x-ray films showing enormous distention of the gastrointestinal canal. Right, opaque catheter is shown in the blind upper end of the esophagus.

FIG. 3. Infant H. (St. Vincent's Hospital). A, postero-anterior broncho-esophagram showing the bronchial tree and the lipiodol finding its way into the stomach. B, bronchogram and esophagram obtained by injecting lipiodol into the upper end of the esophagus. Lateral view (retouched). Note that the site of the fistula is extremely high, at about the level of the first rib.

limits the vital capacity of the infant and with the regurgitation of gastric mucus and acid into the respiratory tree there is usually at least a moderate amount of pneumonitis. This plus the opaque material is likely to limit vital capacity to a degree which may seriously interfere with proper oxygenation. *Under no conditions should barium be used.* This is a severe respiratory irritant and will usually result fatally if a sufficient amount is aspirated into the bronchial tree. (3) *Esophagoscopy* is rarely necessary and is used only in types 3*b*, 3*d* and their variations when the diagnosis cannot be established by other means. We have recently encountered a type anomaly which is unique in our experience and which required both esophagoscopy and the instillation of lipiodol to establish the diagnosis. It consisted of a fistula between the esophagus and the trachea with the upper and lower segments of

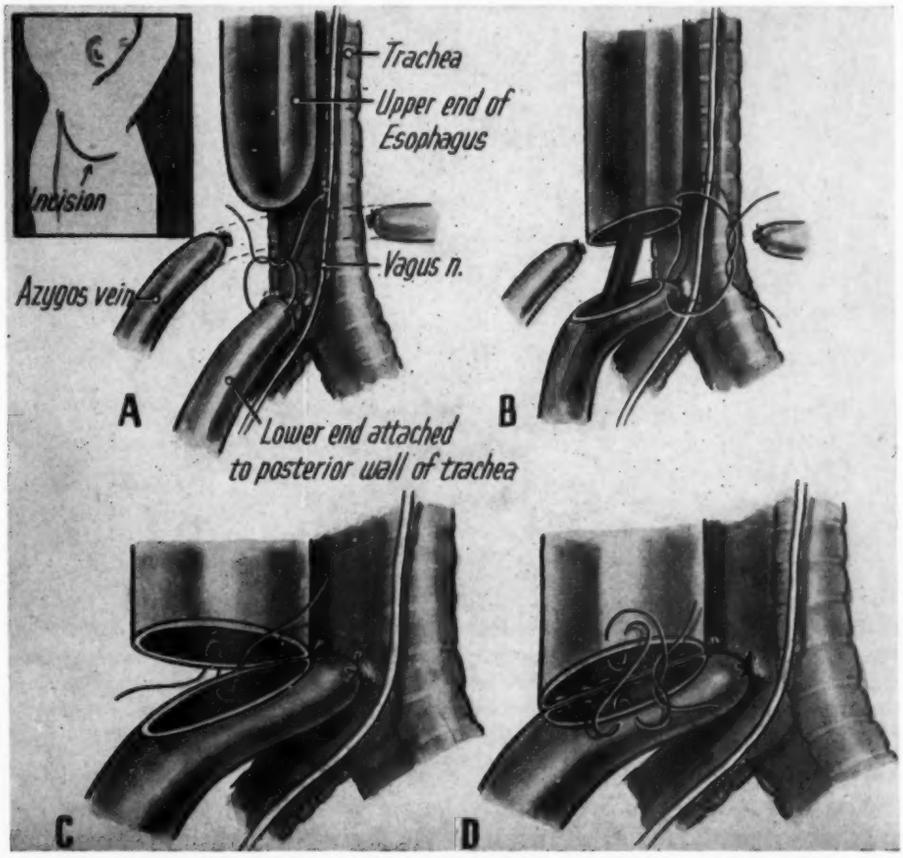

FIG. 4. A, insert shows position of the incision which roughly follows the medial border of the scapula extending outward. The upper end of the esophagus has been identified, the azygos vein doubly ligated and divided, and the fistulous tract tied with transfixed ligatures of silk. B, the blind end of the esophagus has been divided tangentially and a segment of the distal end of the esophagus has been removed. The first stitch is in place. Note that the fistula is not completely divided. C, posterior row of sutures being completed. A No. ooooo silk inverting cross stitch is used. D, the anterior row of sutures are introduced using an interrupted inverting cross stitch of No. ooooo silk.

the esophagus emptying into a wide common channel. The upper part of the esophagus was angulated producing an obstruction which directed ingested liquids into the trachea. The lower segment was then filled by regurgitation from the trachea. The fistulous opening measured approximately .6 cm in diameter. Continuity was re-established successfully after separating the trachea from the esophagus and suturing both sides. (Fig. 3.)

TREATMENT

Haight[4,5] first described the present methods employed in establishing continuity of the atretic esophagus through an extrapleural approach; and many suggestions have been added for the purpose of improving or at least simplifying the technic of the procedure.[6–8] This paper is written primarily for the purpose of describing a technical maneuver which has aided us greatly in the management of the lower segment of the esophagus.

It is usually comparatively easy to identify and mobilize the upper segment. Most of our difficulty has occurred in the management of the lower portion of the esophagus which is extremely thin, narrow and friable. The fistula and a variable portion of the lower esophagus usually obtains its blood supply from the trachea. If the fistula is tied close to the trachea, the blood supply to the fistulous tract and adjacent esophagus may become impaired with resultant slough. In the past the fistula was doubly tied, divided, a small cuff of esophagus removed and the lower segment held with No. ooooo silk sutures. Then the lower

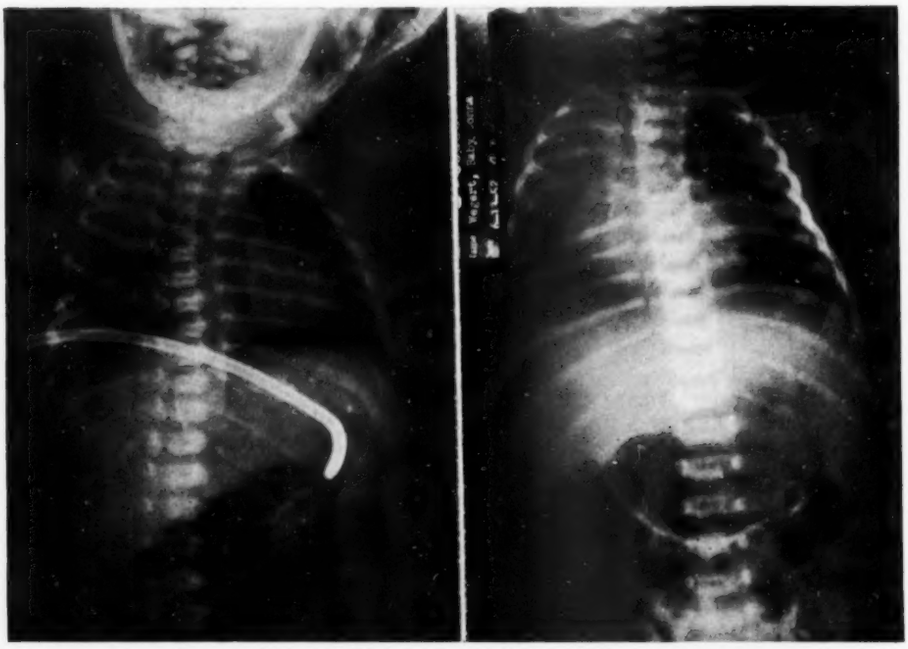

FIG. 5. Left, patient D. W. nine days postoperatively. Shows feeding gastrostomy tube still in place and the right lung almost completely expanded. Right, fifteen days after surgery. The gastrostomy tube has been removed. The right lung has completely expanded.

esophagus was completely mobilized so that the two portions could be anastomosed without tension in an oblique manner as suggested by Gross. Frequently the holding sutures pulled out and the lower margin retracted. Moreover, when this occurred additional esophageal wall was lost because the edge became frayed and could not be used for anastomosis.

A simplified method of handling the lower segment in type 3c atresia has been used in our last six patients. The operation is done under ½ of 1 per cent novocaine local infiltration anesthesia supplemented by the administration of oxygen without an endotracheal tube. An incision is made medial to the right scapula, then 6 to 8 cm. of the fourth or fifth rib are removed subperiosteally. The intercostal bundles are doubly ligated and divided and the pleura stripped forward. The ribs are spread apart by a modified mastoid retractor and the azygos vein is doubly tied and divided. The upper end of the esophagus is easily identified by the introduction of a catheter from above. The vagus nerve is a good landmark for the identification of the lower segment. The fistula is dissected free and doubly tied with transfixion ligatures of silk. (Fig. 4A.) Then the proximal end of the esophagus is divided obliquely and a No. 6 or No. 8 catheter is introduced from below upwards. The distal esophagus is cut on a tangent approximately ½ cm. lateral to the ligature on the fistula, thereby insuring an adequate blood supply. The catheter is then passed into the stomach to be sure that the esophagus is entirely patent. (Fig. 4B.) The catheter is left in place until the anastomosis has been completed and then removed. It should be noted that the fistula is not divided completely, thereby holding the lower segment in place until all sutures have been introduced. For this purpose a cross stitch of No. 00000 silk as depicted in the diagram is employed. (Fig. 4C.) The first stitch is placed about ½ cm. distal to the transfixed ligatures around the fistulous tract and is a simple mattress suture. Recent experiments show that the segments may be safely anastomosed either by inversion or eversion sutures. However, we have had no clinical experience with the latter. The anterior wall of the fistula is not divided, but recanalization cannot take place nor can the lower esophagus retract. (Fig. 4D.) Thus tension on the suture line is eliminated, holding sutures are not required and the calamity of fraying, tearing or sloughing of the distal segment is averted. Moreover, the size of the anastomosis is much larger when the end-to-side rather than the end-to-end technic is

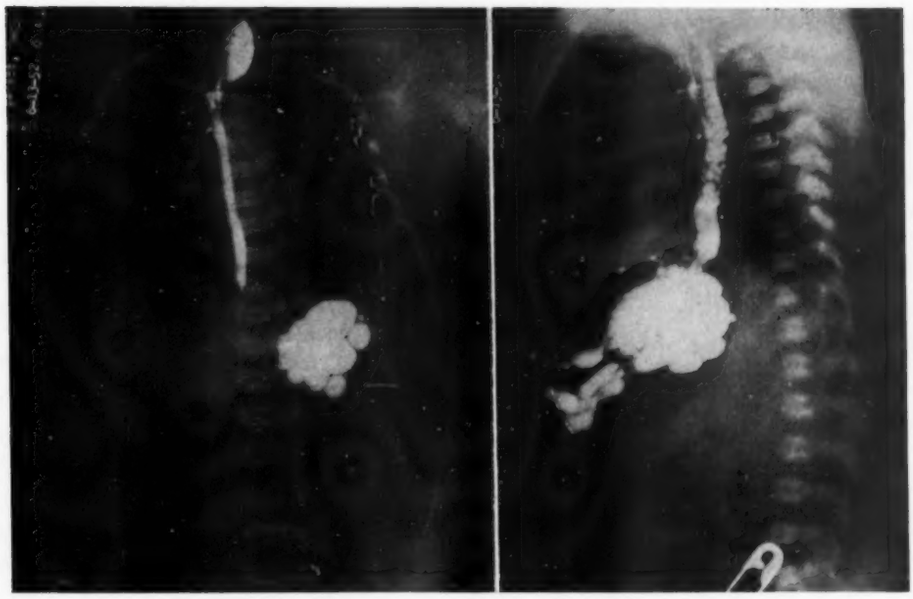

FIG. 6. Left, lipiodol swallow. Postero-anterior film taken on the twenty-second postoperative day. The esophagus is patent without any evidence of constriction. Right, lateral film taken at the same time showing adequate lumen of the esophagus throughout its entire length. The actual site of the anastomosis cannot be detected.

employed and there is less chance for constriction and stenosis at the site of the anastomosis. A small Penrose drain is left extrapleurally for twenty-four hours and the thoracic wound closed with silk in the usual manner. On the day following a feeding gastrostomy is usually done. (Fig. 5.)

POSTOPERATIVE CARE

The following rules have been helpful in avoiding some of the major complications which may occur following surgery:

Duties of the Nurse. A nurse must be in constant attendance during the first four days. Her duties are as follows: (1) The pharynx and trachea are cleared by frequent aspirations using a soft rubber catheter attached to an aspirating machine with low negative pressure (preferably 15 to 20 mm. Hg). (2) The infant is handled as little as possible and is not removed from the oxygen crib or air-lock for any purpose. Bathing, changing, feeding and aspirating are done in the crib. (3) The child is kept on the operated side because the right lung is temporarily atelectatic; and when two or three ribs are removed or wedged, paradoxical respirations may occur. (4) Nothing is given by mouth for seven to eight days. (5) Feeding through gastrostomy tube is by gravity and not by injection. Before each feeding slight suction is used with an asepto syringe so that the stomach is not overfilled. This is necessary because the stomach has been distended and functionless and therefore it is hypotonic. If overloaded, vomiting may occur with damage to the suture line and aspiration of regurgitated material. Also great distention of the stomach interferes with respiration and contributes to anoxic anoxemia. It may take ten to fourteen days for the stomach to regain its normal tonicity and motility.

Suggestions for the Physician. The physician should be alert to the following dangers: (1) Overhydration by parenteral fluids should be avoided. We give about 10 cc. per pound of body weight per day prior to the use of the gastrostomy tube (usually for three days.) (2) Blood transfusions are not often needed except at the time of surgery. The amount given is calculated as part of the total fluid requirement. (3) Feedings through the gastrostomy are usually started twenty-four hours after the catheter has been anchored. Fifteen cc. of 5 per cent glucose in distilled water are given every two hours for the first twenty-four hours. This is increased to 30 cc. the next day and then all parenteral fluids are discontinued. A formula is started on the third day giving 15 to 30 cc. every two hours. On the eighth postoperative

day we start 5 per cent glucose and distilled water by mouth giving 15 to 30 cc. every two hours and increasing the amount daily. The gastrostomy tube remains open at all times thereby avoiding overdistention. A formula by mouth is started on the ninth day. (4) The gastrostomy catheter is removed on the twelfth to fourteenth day.

CONCLUSIONS

1. We have reviewed some of the important diagnostic criteria of congenital atresia of the esophagus.

2. The simplified method of establishing continuity between the upper and lower segments in type 3c results in an adequate lumen throughout the entire esophagus (Fig. 6.)

3. The technic which we have described is much easier than complete division of the fistula with anastomosis.

4. We have emphasized the importance of circumspect postoperative care.

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Review

HIGHLIGHTS IN THE TREATMENT OF VARICOSE VEINS AND ULCERS

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THE history of the treatment of varicose veins, as of all surgical treatment, must be divided into two periods. Toward the end of the nineteenth century the work of Semmelweis, Lister and Pasteur on bacterial infection made progress in surgery possible, so that the surgical results before 1866 (the year when Lister published his paper, "On the Antiseptic Principle in the Practice of Surgery") are not comparable to the surgical results since that time.

DIVISION OF PERIODS

In this review of the treatment of varicose veins and ulcers the period extending from the time of Hippocrates (500 B.C.) to the time of Schede (1877 A.D.) is designated as "the preantiseptic period" and that from Schede to the present time as "the antiseptic period." I shall refer briefly to the preantiseptic period, mentioning the operations of Hippocrates, Galen, Aegineta, Paré, Home and Brodie. The antiseptic period will be divided under four subheads: (1) the non-ambulatory operative period (1877–1916); (2) the injection period (1916–1933); (3) the ambulatory, injection and operative period (1933–1938); and (4) the ambulatory operative period (1938–1952).

Non-ambulatory Operative Period. This period, while predominantly operative, also covers the works of Tavel who in 1904 advocated the production of chemical thrombosis of the great saphenous vein after its ligation if thrombosis did not occur spontaneously by the second postoperative day, and Schiassi who in 1908 introduced retrograde injection at the time of ligation and division of the vein. The close of this period is marked by the publication of the famous paper by Homans, "The Operative Treatment of Varicose Veins and Ulcers, Based upon a Classification of These Lesions." This was the only paper on varicose veins to appear during 1916. Deaths from pulmonary embolism were forcing surgeons to abandon the operative treatment of varicose veins (Bernsten) and to seek a safer method of treatment (von Kettel).

Injection Period. As early as 1911 Linser, working with patients with syphilis in the Tuebingen clinic for cutaneous diseases, noticed that the veins became sclerosed after the intravenous injection of mercury bichloride. He treated patients with varicose veins by this method, and subsequently, the treatment of varicose veins by injection, because of its safety, applicability and cheapness, was rapidly adopted throughout the world.[1] While the outstanding protagonist of the operative treatment during this period was Homans (1916, 1922, 1928, 1929, 1934), McPheeters (1927, 1929, 1930, 1931) was the most prominent exponent of the treatment of varicose veins by injection. Homans (1938) began to use retrograde injection at the time of operation while McPheeters (1938) advocated high saphenous ligation in selected cases. It will be noted that the number of papers published on the treatment of varicose veins by injection rose steeply in 1927, reaching its climax in 1930, from which summit it has fallen to its present low level. (Fig. 1.)

The injection period ended in 1933 with the publication of the report by deTakats and Quillin, "Ligation of the Saphenous Vein; a Report on 200 Ambulatory Operations." Others[2] had practiced ligation as a supplement

[1] von Kettel; McPheeters (1929).
[2] Moore and Knapp; Moskowicz.

to treatment by injection, the patient being ambulatory, but this procedure did not become popular until after 1933. During the latter part of this period papers began to appear dealing with the recurrence of varicose veins following treatment by injection,[3] and it

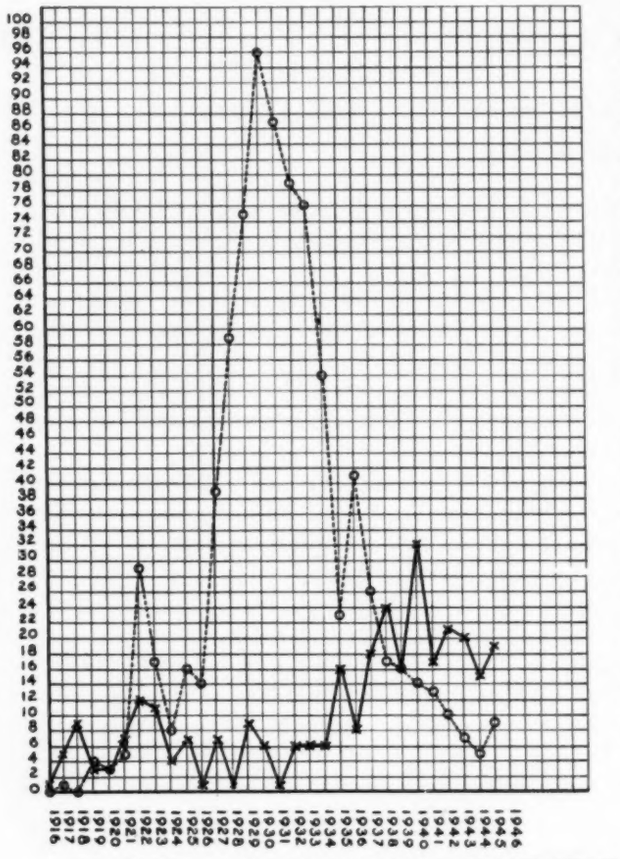

FIG. 1. Diagram showing the number of papers published since 1916 on the operative method and treatment of varicose veins by injection.

became evident that the injection method alone was inadequate.

Ambulatory, Injection and Operative Period (1933–1938). This period is characterized by the fact that nearly every one realized a dilated saphenous system had to be divided to prevent recanalization of the veins following injection. The ligation and division of the main trunk of the saphenous vein was used only as a supplement to the sclerosing treatment, and then only when the valves of the saphenous vein could be demonstrated to be incompetent.

[3] deTakats (1931); Howard, Jackson and Mahon.

During this period the idea gradually spread that something more than simple ligation and division of the main stem of the saphenous vein was required and that ligation and division of all the branches at the saphenofemoral junction had to be done to prevent recurrence.

Ambulatory Operative Period (1938–1952). This period is characterized by the accentuation on the operative treatment of varicose veins, with the decline of treatment by injection, especially retrograde injection at the time of operation. The tendency toward more extensive operative removal of the involved veins is evident in the reports of Horgan, Mahorner, Sherman, Sapiro, and Hodge, Grimson and Schiebel. More attention is now being directed to other incompetent communications between the superficial and the deep veins besides the saphenofemoral junction—those in the thigh and in the leg.

I shall now proceed with a detailed and consecutive study from a historical standpoint of the many contributions to this subject. Extensive quotations of historical interest will be made. All drawings are taken from the originals except the one illustrating Schede's operation, as his paper was not illustrated.

This review does not take into consideration ulcers of the leg of other types than those of etiologic significance in reference to varicose veins. The problem of postphlebitic ulcerations is not included.

PREANTISEPTIC PERIOD (500 B.C.–1877 A.D.)

Although Hippocrates (500 B.C.) advocated that multiple punctures be made in varicose veins and Galen (130–201 A.D.) recommended that they be torn out with a hook, Aegineta (625–690 A.D.) was probably one of the first surgeons to ligate the great saphenous vein above the knee. The following paragraph is quoted from the translation of Aegineta's works by Adams:

"The varix is a dilatation of a vein occurring sometimes in the temples, sometimes in the hypogastric region below the navel, sometimes in the testicles, but more especially in the legs. For the most part it derives its origin from a melancholic humour. The operation for those of the testicle we have already described when treating of cirsocele, and those in the leg may be operated upon in a similar manner, making the attempt upon those in the inner parts of the thighs, where they gen-

erally arise; for below this, as they are divided into many ramifications, they are more difficult to succeed with. Wherefore, having washed the man, and applied a ligature round the upper part of the thigh, we are to direct him to walk about, and when the vein becomes distended we are to mark its situation with writing ink or collyrium, to the extent of three fingers' breadth or a little more, and having placed the man in a reclining posture with his leg extended, we apply another ligature above the knee; and where the vein is distended we make an incision upon the mark with a scalpel, but not to a greater depth than the thickness of the skin, lest we divide the vein; and having separated the lips of the wound with hooks, and dissected away the membranes with crooked specilla, like those used in the operation for hydrocele, and laid bare the vein, and freed it all around, we loose the ligatures from the thigh, and having raised the vessel with a blind hook, and introduced under it a needle having a double thread we cut the double of it, and opening the vein in the middle with a lancet, evacuate as much blood as may be required. Then having tied the upper part of the vessel with one of the ligatures, and stretched the leg, we evacuate the blood in the limb by compression with the hands. Then having tied the lower part of the vein, we may either cut out the portion intermediate between the ligatures, or suffer it to remain until it drop out of its own accord with the ligatures; then we have to put a dry pledget into the wound, and apply over it an oblong compress soaked in wine and oil, and secure them with a bandage, and accomplish the cure by the treatment applicable in cases of suppuration. I am aware that some of the ancients do not use ligatures, but cut out the vessel immediately after it is laid bare, whilst others stretch it from below and tear it out by force. But the mode of operating now described is of all others the safest."

The operation for varicose veins as described by Paré (1510–1590 A.D.) is much like the operation advocated by Aegineta (625–690 A.D.). The following extract is taken from Johnson's translation of Paré's works:

"A varix is the dilatation of a vein, some whiles of one, and that a simple branch, other whiles of many. Every varix is either strait or crooked, and as it were infolded into certain windings within itself. Many parts are subject to varices; as the temples, the region of the belly under the navel, the testicles, womb, fundament, but principally the thighs and legs. The matter of them is usually melancholy blood, for varices often grow in men of a melancholy temper, and which usually feed on gross meats, or such as breed gross and melancholy humors. Also women with child are commonly troubled by them, by reason of the heaping together of their suppressed menstrual evacuation. The precedent causes are a vehement concussion of the body, leaping, running, a painful journey on foot, a fall, the carrying of a heavy burthen, torture or racking. This kind of disease gives manifest signs thereof by the largeness, thickness, swelling and colour of the veins. It is best not to meddle with such as are inveterate; for of such being cured there is to be feared a reflux of the melancholy blood to the noble parts, whence there may be imminent danger of malign ulcers, a cancer, madness or suffocation. When as many varices and divertly implicit are in the legs, they often swell with congested and dried blood, and cause pain, which is increased by going and compression. Such like varices are to be opened by dividing the vein with a lancet, and then the blood must be pressed out, and evacuated by pressing it upwards and downwards: which I have oft-times done, and that with happy success to the patients, whom I have made to rest for some few days, and have applied convenient medicines. A varix is often cut in the inside of the leg a little below the knee, in which place commonly the original thereof is seen. He which goes about to intercept a varix downwards from the first original, and as it were fountain thereof, makes the cure far more difficult. For hence it is divided, as it were, into many rivulets, all which the Chirurgeon is forced to follow.

"A varix is therefore cut or taken away so, to intercept the passage of the blood and humours mixed together therewith, flowing to an ulcer seated beneath; or else left that by the too great quantity of blood, the vessel should be broken, and death be occasioned by a haemorrhagie proceeding from thence. Now this is the manner of cutting it. Let the patient lye upon his back on a bench or table, then make ligature upon the leg in two places the distance of some four fingers each from other, wherein the excision may be made, for so the vein will swell up and come more in light;

and besides, you may also mark it with ink; then taking the skin up between your fingers, cut it long-ways according as you have marked it; then free the bared vein from the adjacent bodies, and put there under a blunt-pointed needle (lest you prick the vein) thred with a long double thred, and so bind it fast: and then let it be opened with a lancet in the middle under the ligature, just as you open a vein, and draw as much there hence as shall be fit: then streight make a ligature in the lower part of the fore mentioned vein, and then cut away as much of the said vein as is convenient between the ligatures, and so let the ends thereof withdraw themselves into the flesh above and below: let these ligatures alone until such time as they fall away of themselves. The operation being performed, let an astringent medicine be applied to the wound and the neighboring parts; neither must you stir the wound any more for the space of three days. Then do all other things as are fit to be done to other such affects."

Home, surgeon to the army and St. George's Hospital, included in his book a chapter entitled "Of Ulcers Attended with a Varicose State of the Veins of the Limbs and the Advantage Derived in Such Cases from Including the Vena Saphena in a Ligature." In this chapter Home wrote:

"It appeared to be an object of no small importance to take off a part of the pressure of this column of blood, which would probably allow the part lower down to be in a more easy state, and better able to recover themselves; it might also prevent the veins from being still more dilated, and so far stop the progress of the disease in these vessels—The only mode of doing this, that suggested itself, was that of making an artificial valve, by passing a ligature round the vena saphena as it passes over the knee joint, and obliterating the vein at that point. The reason for applying the ligature upon this particular portion of the vein is that just at that part the branches from the different parts of the leg unite and form a common trunk, and as it is the preternatural enlargement of some, or all these branches, which constitutes the principal part of the disease, the most effectual mode of taking off the weight of the column of blood contained in the common trunk will be by obliterating it, as near as possible to the termination of those branches into it."

Home operated with the patient standing, ". . . and if placed on a table, upon which there is a chair, the back of the chair will serve him to rest upon, and he will have the knee joint at a very convenient height for the surgeon." The case histories of nine patients with ulcers were discussed. As to the method of operation, the saphena magna was picked up between the fingers and the overlying skin incised. "After this, a silver, crooked needle, with the point rounded off, will readily force its way through the cellular membrane connected with the vein without any danger of wounding the vessel, and carry a ligature round it." The patient was put to bed, the ligature tied and the edges of the skin taped together, with the suture protruding from the wound.

Although Brodie described the Trendelenburg test in 1846 and was well acquainted with Sir Everard Home's operation for varicose veins, he was opposed to operating for varices because of the danger of infection.

"When I was a student, nothing was more common than to see a patient with varicose veins standing on a table and leaning over the back of a chair, to have this operation performed.—I had a patient, for example, in whom there was an unusually large cluster of varicose veins on the inside of the leg, while the vena saphena major was of enormous diameter, so that the valves could evidently be of no use. If I put on a bandage and squeezed the blood out of the veins below, and then put my thumb on the vena saphena major above, so as to stop the circulation through it, I found, on taking off the bandage, the patient being in the erect posture, that the cluster of veins below filled very slowly from the capillary vessels. But, if, the patient being in the erect posture, I took off my thumb from the vena saphena major, the valves being of no use, the blood seemed to flow down from the trunk of the vena saphena major, contrary to the circulation, and filled the varicose cluster below almost instantaneously. I can understand that a ligature upon the vena saphena major, under these circumstances, would in a great degree lessen the inconvenience arising from the distention of varicose veins below."

ANTISEPTIC PERIOD (1877–1947)

Non-ambulatory Operative Period (1877–1916). Schede's paper on the treatment of varicose veins was published in February,

1877. He passed percutaneous ligatures under the veins and tied them over a gauze roll; later he tied them over a stiff rubber tube to insure the cutting through of the vein by the ligature. Schede wrote, "I have modified the method somewhat in order to avoid necrosis of the skin where it is compressed by the catgut tied over the gauze roll. I now use, instead of the gauze roll, a strong-walled rubber tube as big as the little finger, in order to replace the constant inelastic pressure of the former by the elastic pressure of the latter. After the percutaneous ligatures are placed in the desired number, the rubber tube is placed lengthways over the vein, and the catgut ligatures are tied quite firmly while an assistant presses the tube in place. The elasticity of the rubber tube tied in this way suffices to keep the walls of the vein completely pressed together.—Half of the ligatures are removed in 12, the other half after 24, hours.—Healing is complete in 8 days. Decubitus of the skin or cutting through of the catgut ligatures has not occurred, although stretches of vein ½ meter long, from the ankle to the middle of the thigh, with the help of 30 ligatures, have been obliterated." (Fig. 2.)

In the discussion following the presentation of Madelung's paper in 1884, Schede said, "I might say that my observation concerning the method which I have performed once, agrees completely with that of Herr Madelung. It is possible, by compression of the veins against a rubber tube with the help of percutaneous sutures, to obliterate the veins, but one is often grieved to see that veins completely obliterated have again become patent. This has happened to me many times and I have completely given up this method because of it. I now operate according to the method described by Herr Madelung and believe it to be the most efficient. One can also simply expose the vein in 6, 8, or 10 places and doubly ligate and divide it; I believe this to be a rather reliable method, although, of course, total extirpation is best."

Madelung's operation for varicose veins, published in 1884, is seen today in improved forms in the procedures of Faxon, Linton and Mahorner. Madelung wrote, "Permit me to explain my procedure by this illustration which shows a typical, although not the most severe case, of varicose ulcer of the leg. A tourniquet is loosely applied to the upper thigh causing the peripheral veins to bulge. The ulcers are scraped with a sharp knife, disinfected with chloride of zinc and covered with iodoform gauze throughout the operation. A skin incision running the length of the leg with a slight anterior curvature exposes the diseased venous

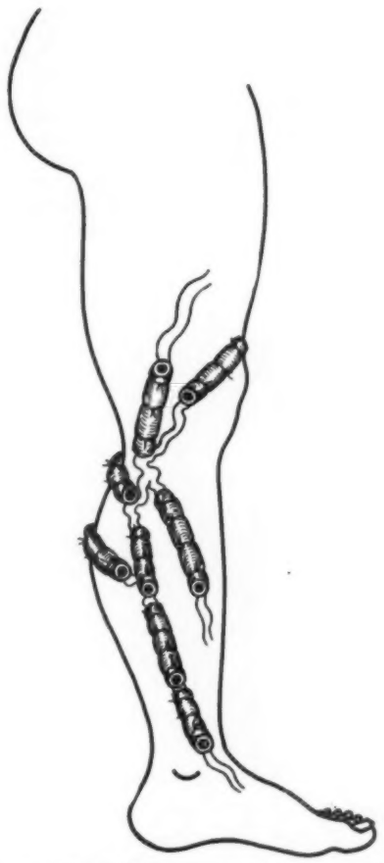

FIG. 2. The Schede operation for varicose veins of 1877.

plexus. Numerous ligatures are required to tie off the small vessels which penetrate the fascia of the muscles of the leg. One must often excise the enlarged veins which course under the deep fascia. After the extirpation of the veins the tourniquet is loosened and the numerous wound pockets are drained by rubber tubes through stab incisions, the skin incision is sewed up, a bandage is applied and the extremity is suspended. The rule to make the skin incision in the manner described is important. Care is required in the formation of the skin flaps because if the skin is too thin it will slough. In the single case in which I had to keep a patient in the hospital longer than three weeks was where I had to extend the

skin flaps in order to remove a clump of veins as big as a man's fist from the popliteal space." (Fig. 3.)

Trendelenburg's famous paper appeared in 1890. (Fig. 4.) The following extracts are taken from it:

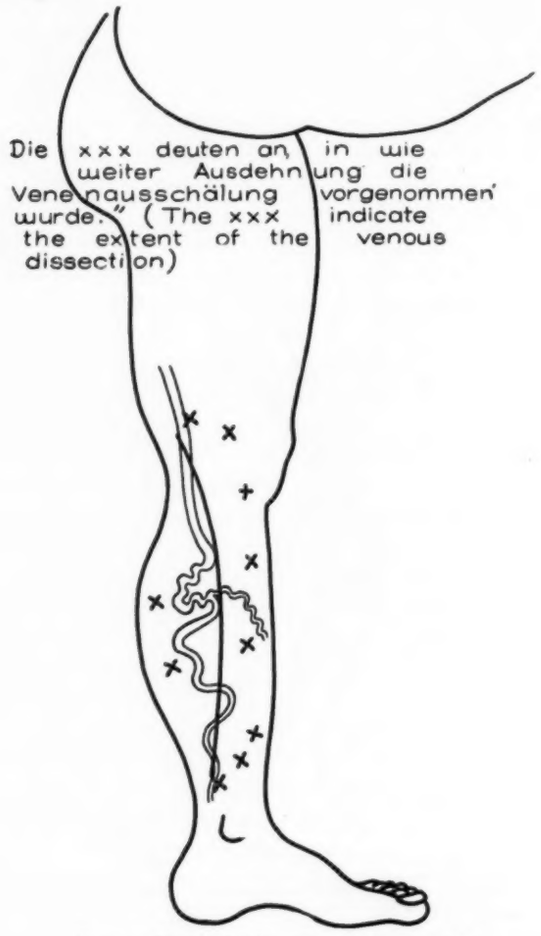

FIG. 3. The Madelung operation of 1884.

"The cases of varicosities of the great saphenous vein are divided into two separate groups. Those where the varicose degeneration is limited to the branches of the great saphenous vein, where the main trunk is unchanged, and those where the main trunk of the saphenous vein is greatly dilated and varicosed. Only those of the latter group, the cases of varicosities of the main trunk and its branches, are considered in the following review.

"Men are affected to a higher degree than women. The first sign of the change often appears at puberty and the history may reveal a hereditary disposition to vein disease; besides the varicosities of the leg one may also find hemorrhoids or a varicocele. In women repeated pregnancies play an important role as causative agents.

"The participation of the trunk of the great saphenous vein is revealed when one looks at the bare leg on standing. One sees the vein

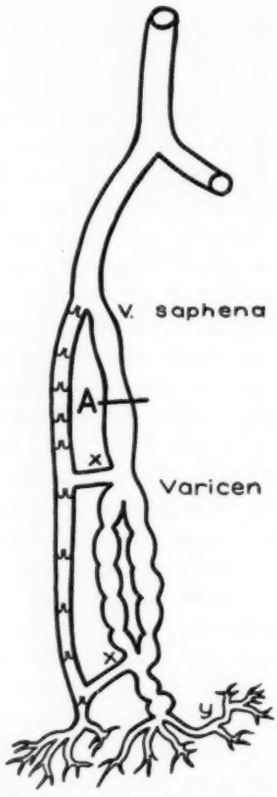

FIG. 4. Trendelenburg operation of 1890. A, the level recommended for ligation and division of the great saphenous vein; X, a communicating vein; Y, represents the capillaries.

on the inner side of the knee joint behind the internal femoral condyle and above on the inner side of the thigh in its lower third, as a serpiginous cord as thick as the thumb, coursing upward under the thinned out skin. At the junction of the lower and middle third of the thigh there is usually an especially prominent varix, a second one usually larger often marks the entrance of the vein into the fossa ovalis. It is less prominent than the first because it is covered by a thicker layer of fat. In the whole course of the upper two-thirds of the thigh, except in thin individuals, the dilated saphenous vein is less distinctly seen than in the lower third. Below the knee joint the enlarged trunk of the saphenous vein breaks up into irregularly formed, strongly

convoluted and dilated branches which become distended on standing and appear blue through the thinned-out skin.

"The circumscribed varices of the trunk mark the position of valves in the vein, as varicose degeneration of the vein occurs chiefly where the valves are. If one removes such a circumscribed varix of the saphenous vein one will find both parts of the valve either intact or scarred and shrunken. The greatest diameter of the dilatation does not lie above the valve as was formerly believed, but below it, not proximal but distal, a fact, which until now, has not been observed. Apparently the walls of the veins are weakest below the valves, since normally, the pressure is lowest there. If the valves become incompetent through dilatation of the vein, and the vein wall is subjected to the abnormally high pressure of a high column of blood, then these places will give way to the pressure first, hence a circumscribed varix developes. Why, of the numerous places where the valves of the saphenous vein are found (Klotz found 8 to 18) just those places at the junction of the middle and lower thirds of the thigh and just before the saphenous vein enters the femoral vein, are the places of preference for the largest circumscribed varices, is not explained by the present knowledge of the anatomy of the saphenous vein.

"That which lends special importance to the cases of varicosities of the leg with simultaneous dilatation of the trunk of the saphenous vein is the insufficiency of the valves of the saphenous trunk which occurs with only a relatively insignificant dilatation of the lumen of the vein. The vena cava, the v. iliaca and the trunk of the femoral vein directly below Poupart's ligament have, as a rule, no valves. When the valves of the trunk of the saphenous vein become incompetent one finds no valves from the varicosities of the leg to the right side of the heart. The vena cava, the v. iliaca, the upper part of the femoral and the saphenous veins form a single system of tubes unobstructed by valves, the movement of whose fluid contents, for the most part, is influenced only by gravity.

"This is easily demonstrated in the following way: if the patient lies down in the supine position the varicosities of the leg will diminish in size and become less tense but remain moderately filled as long as they are below the level of the heart. If the patient's leg be raised (with the patient supine) the veins will empty, the more, the higher the leg is raised above the level of the heart. If the leg is raised to the vertical position the blood flows down rapidly and the atmospheric pressure presses in the thinned out skin over the varicosities into the lumen of the veins. When the patient is standing the convolutions of the circuitous cords are prominent; in the supine position we see a system of ditches and ridges, corresponding exactly in pattern to a dried up river system.

"Keeping the leg raised, if one brings the patient's trunk half-way to the sitting position, so that the heart and superior vena cava are raised to a higher level, the saphenous vein will partly fill with blood. In thin individuals one can see and feel the column of blood as it rises to the level of the heart. It rises when the trunk is raised up and falls when the trunk is lowered. The vena cava, v. iliaca and saphenous vein behave as a communicating system of tubes in the physiological sense.

"In this experiment, besides gravity, the pressure within the abdominal cavity also acts on the column of blood in the saphenous vein. Using vertical communicating glass tubes filled with fluid, if we close one of the tubes with a thin rubber diaphragm and press on it with the finger, the column of fluid in the other tube rises. Similarly the column of blood climbs in the saphenous vein when the patient, being in the supine position, coughs or strains down. If one lowers the leg so that it is only slightly above the level of the heart, then one will see, with the impulse of coughing, a wave of blood running out through the saphenous and its branches, and again flow back. The dilated saphenous vein forms therefore, with the patient supine, a sort of manometer applied to the abdominal cavity. It is so sensitive that even the weight of a finger on the abdominal wall causes a movement in the fluid in the saphenous vein.

"When the patient stands up the whole canal system is filled with blood so rapidly that it can come only from a back flow of blood from the vena iliaca, not as a flowing in from the capillaries.

"A very simple experiment proves the correctness of this observation. One lays the patient down, raises the leg to the vertical letting all of the blood drain out of the saphe-

nous system, and then compresses, with one finger, the main trunk of the saphenous vein in the place where it is most distinctly seen. Now the patient stands up without the compressing finger being removed from the saphenous. It is evident that the whole tract

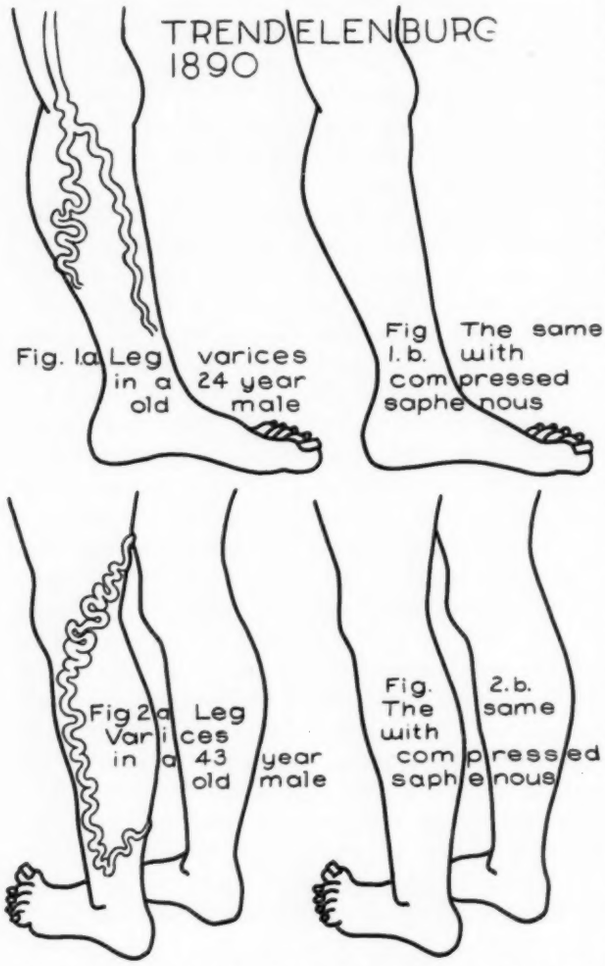
TRENDELENBURG
1890
Fig. 1a Leg varices in a 24 year old male
Fig 1.b. The same with compressed saphenous
Fig 2a Leg Varices in a 43 year old male
Fig. 2.b. The same with compressed saphenous

FIG. 5. Reproduction of a drawing representing the Trendelenburg test as recommended by him.

of the saphenous system in the standing position is quite empty. After about ¼ to ½ min. one notices that the varicosities of the leg gradually begin to fill with blood. The filling, however, as long as the compression of the trunk of the saphenous vein continues, is not nearly so tense as it formerly was. If one removes the compressing finger, a large amount of blood shoots down into the saphenous system from above, and the original picture of tensely distended varicosities is again presented. (Fig. 5.)

"If the simple fact, that the varicose branches of the saphenous due to dilatation of the trunk in consequence of the absence of the valves in the vena cava causes the dangers which beset the patient with varicosities of the leg, it follows that by operation, permanently closing the saphenous vein and preventing the back flow of blood from the iliac vein through the saphenous into the varicosities and at the same time relieving the veins of the leg and feet from the abnormal pressure, would give relief. Such a permanent occlusion, without danger, I have obtained by double ligation and division of the vein between the ligatures, and I have performed this operation on a large series of cases with the best of results since 1880; I can recommend it for all cases of varicosities of the leg with dilatation of the main trunk of the saphenous vein.

"He who does not understand the described hydrostatic relations and who recalls the initial appearance of varicosities in many cases of the iliac vein (pregnancy) may think it irrational to attempt to prevent the engorgement of blood by tying off the outlet pipe. But it is to be recalled that one is not ligating the iliac vein, or the femoral vein but only the great saphenous vein, which is not the only channel for draining the branches of the saphenous system of veins. There are communications with the deep veins and with the small saphenous vein through the arcus dorsalis and by frequent direct communications.

"Of the existence of communicating veins, which carry the blood of the leg from the varicosities into the deep circulation one can easily determine in every single case before ligation of the saphenous vein. With the patient in the supine position and with the varicosities still filled, if one compresses the saphenous vein before raising the leg, then elevates the extremity, the varicosities would remain filled if the saphenous vein were the only draining channel.—One will have to make sure, in every single case, through this compression test, that the dilated trunk of the saphenous is not the only means of drainage from the varicosities.—

"Not rarely there is duplication of the saphenous trunk in longer or shorter lengths and if both trunks are dilated, then ligation of each or of the common stem above the division is necessary. Usually the juncture of the middle and lower thirds of the thigh, where the dilatation is especially marked, is the

place for the finger compression test and also for the ligation. Sometimes I have done the ligation higher, sometimes on the dilated accessory trunk or on the small saphenous vein when it is dilated and communicates with the great saphenous vein.

"Little need be said about the technique of the operation. Through a 3 cm. skin incision the vein is freed up and isolated. A catgut suture on an aneurysm needle is placed under the vein above and below, the leg is raised and the blood drained out, the vein is doubly ligated and divided between the ligatures and and skin is closed with sutures.—The mere ligation of the vein without division is not always sufficient, as I repeatedly saw after Schede's vein ligations, as the vein gradually reestablishes itself."

Concerning the "private" or "local circulation" of blood in the extremity affected by varicose veins, Trendelenburg wrote: "As soon as the muscles become active pump-like work is established with the aid of the valves in the communicating veins. The blood flow into the deep veins is accelerated and blood is aspirated into the communicating veins. It is probable that the blood in the saphenous reservoir flows backward and is again replaced from the femoral vein above, so that we are dealing with a local circulation in the lower extremity where the blood in the deep veins of the leg is pumped upwards and, in part, overflows back into the great saphenous vein."

Although the work of Homans (1934), and McPheeters and Rice (1929) corroborated Trendelenburg's idea concerning the circulation of blood in varicose veins, Heller failed to do so.

Petersen in 1893 reported forty cases in which he had operated for varicose veins and in which a *Cirkelschnitt* had been performed around the calf of the leg. Petersen described his method as follows:

"The operation is performed under anesthesia. A clean cut incises the skin down to the deep fascia, all veins are caught and tied and the larger veins are excised. A continuous suture is used to approximate the edges of the wound but exceptionally the wound is not closed or only a guiding suture is placed. For the location of the incision generally the region somewhat above the greatest diameter of the calf of the leg is chosen, which in our cases was always above the complicating ulcers, scars, thromboses, etc." (Fig. 6.)

Petersen's operation was an attempt to relieve the leg from the harmful effects exerted by the pressure of the column of blood from above, based on the principles of hydrodynamics as described by Trendelenburg.

Perthes in 1895 reviewed sixty-three cases

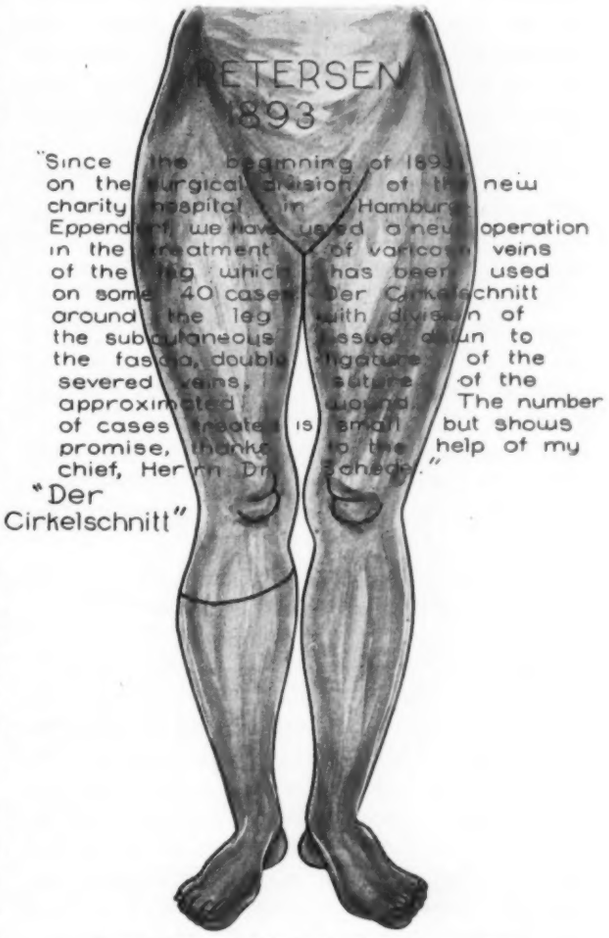
PETERSEN
1893
"Since the beginning of 1893 on the surgical division of the new charity hospital in Hamburg Eppendorf we have used a new operation in the treatment of varicose veins of the leg which has been used on some 40 cases. Der Cirkelschnitt around the leg with division of the subcutaneous tissue down to the fascia, double ligature of the severed veins, suture of the approximated wound. The number of cases treated is small but shows promise, thanks to the help of my chief, Herrn Dr. Schede."
"Der Cirkelschnitt"

FIG. 6. The *Cirkelschnitt* of Petersen, 1893.

in which the Trendelenburg type of operation had been performed, twenty-four of which were bilateral. There were eighty-seven operations in all, seventy-six of which had been associated with ulcers. Forty-one patients had been followed up from five months to nine years postoperatively. Thirty-two had remained healed and in nine there were recurrences. To prevent recurrence Perthes advised that a segment of the vein be resected and the method altered:

"Finally it appears indicated in those cases where the saphena magna shows no clearly defined trunk or has many branches that the operation should be placed as high as possible

The higher the trunk is ligated the less the number of branches above the ligature and the greater the likelihood of cutting off the abnormal blood pressure from the system of varicosities. One can see in those cases of widespread varicosities of the leg that the compression test applied at the site of entrance of the saphena magna into the fossa ovalis produces results while in all other places the Trendelenburg test produces none or only transitory diminution of the varicosities. It is the operative site of choice in these cases."

Perthes was probably one of the first to advocate high saphenous ligation. Concerning the Perthes test for the competency of the valves of the communicating veins, he wrote: "I observed that patients who had had the saphenous vein ligated showed massive filling of their varicosities on standing but that the varicosities became invisible as soon as the patient walked a few steps. Also prior to operation if the patient took a few steps while the saphenous vein was being compressed with a tourniquet or the finger the varicosities diminished in size."

In 1896 Moore reported on twenty-two patients upon whom he had operated for varicose veins and ulcers. He reviewed Trendelenburg's paper but modified Trendelenburg's operation in that he made a transverse incision near the groin, doubly ligated and divided the vein (sometimes he only ligated it) using silk. He allowed fifteen of the twenty-two patients to go home immediately, following them up in the outpatient department. Because of the lack of hospital beds early ambulation was required over thirty years before deTakats and Quillin's report in 1938. Moore wrote: "Allowing the patients to go home. This proceeding I scarcely care to advocate, though I am quite prepared to defend it. If there were unlimited beds, then such cases might no doubt be treated as in-patients, with less anxiety to the surgeon. The fifteen cases treated in the out-patient department have done as well as could be desired, and the operation certainly enlarges the province of the out-patient surgeon."

In 1904 Tavel combined ligation with the injection of a chemical to produce thrombosis of the vein. Tavel wrote: "If one reads the reports of Perthes, Bahl, Hippmann, Lenzner, Faisst, Jung, Stusgaard, Rautenberg, Heintze, Grzes, Herz, Charrade, Estienny, Cordebart and others, one gets the impression that thrombosis is a very serious complication. Most of these authors remark that this accident is not of frequent occurrence. On the contrary, I wish to say that for a definitive cure it is a good thing because it is just these cases that do not recur and which show the best results. Accordingly in 25 cases which I have operated upon in my private practice where thrombosis has not spontaneously developed I have produced it in all of the varicose vessels, in 4 cases with the best results. Tecknik der Ligature. The ligation should be high. If the varicosities are only on the legs, the site for the ligation is above the knee; when the varicosities reach the knee or above, the ligation should be at the entrance into the femoral vein.—In this method the ligature serves only as a barrier against the extension of the thrombus or embolism, it serves only to break the blood stream, while the thrombosis, spontaneous or artificially produced, causes atrophy and obliteration of the varicosities."

Tavel preferred simple ligation by the subcutaneous method (no cutaneous incision) but also used the percutaneous ligature of Schede. If thrombosis of the saphenous vein had not developed by the second day after ligation, iron chloride was injected into the vein.

In 1905 Keller devised a wire for complete extirpation of the saphenous vein and was still using it as late as 1924, with a complicated percutaneous ligature to obliterate varices not torn out by the wire.

Mayo in 1906 reported on his vein stripper for removing varicose veins. (Fig. 7.) In this paper he described a test for ascertaining the patency of the deep venous circulation:

"In deciding the advisability of operations in which there is a previous history of severe phlebitis involving the deep vessels, we apply an elastic bandage from the foot to above the knee. If this bandage can be worn with comfort, an operation should give relief. If the bandage causes discomfort, it is probable that the superficial vessels are necessary to the circulation of the limb."

Mayo removed the internal saphenous vein from 8 inches (20.32 cm.) above the knee to 4 inches (10.16 cm.) below; he also excised chronic ulcers and skin grafted the defect.

Babcock in 1907 used a 26 inch (about 66 cm.) long copper or brass acorn-tipped vein extractor to tear out the saphenous vein. He

combined this with Petersen's *Cirkelschnitt* or Powell's interrupted *Cirkelschnitt*.

In 1908 Friedel reported on a new type of operation, called *der Spiralschnitt*. He worked under Rindfleisch's suggestion, the operation being known as the Friedel-Rindfleisch operation. (Fig. 8.) Friedel wrote:

"If one attempts to cure the varicosities by removing the pressure, then the operation of Trendelenburg, double ligation and division of the vein is indicated. This is only applicable when the main saphenous vein is varicosed and the Trendelenburg test is positive. It is clear that with intact deep valves that the pressure in the saphenous vein is diminished by the ligation. This removal of pressure appears in many cases to partly or entirely cure the varicosities. If the deep valves are not intact or do not function, or if the course of the saphenous reestablishes itself, recurrences develop. Thus the operation is used in selected mild cases only. If Trendelenburg's test is not positive, the varices must be excised. The skin incision begins in the thigh over the saphenous and extends over its main branches and they are removed under visual control with careful hemostasis. This operation is useful only when the varicosities are not incorporated in dense scar tissue or with the skin.

"There are cases where the varices are so extensive that it is impossible to remove them all. The varices are so incorporated in dense scar tissue that their removal is out of the question.—The idea of the spiral was developed by Herr Dr. Rindfleisch in a small way, then completely around the leg and this was extended more and more until in the worse cases the leg is encircled 6 to 7 times."

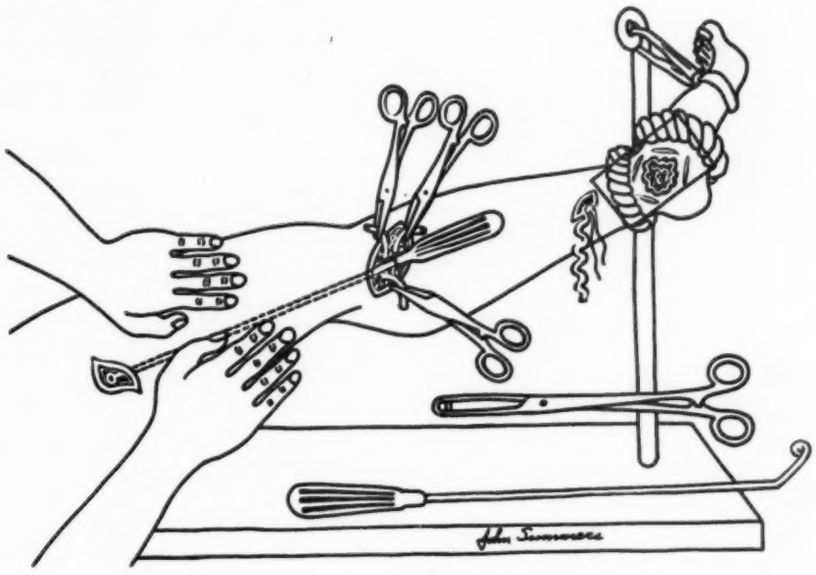

FIG. 7. The Mayo operation of 1906. The drawing shows the ulcer skin grafted and with a celluloid covering. Also shown are the suspension of the leg, the stripping of the great saphenous vein and the Mayo strippers.

The wound was packed open, healing by secondary intention, so that "finally a firm deep penetrating scar develops which is the best protection against a recurrence of the varices."

Schiassi in 1908 introduced retrograde injection of a sclerosing chemical into the saphenous vein at the time of ligation. He injected 30, 40 or 50 cc. of strong solution of iodine into the distal part of the vein, with the purpose of sclerosing the varicosities in the leg: "After having anesthetized the skin by the injection of a few c. c. of novocaine, I make an incision 5 to 6 cm. in length above or below the femoral condyle according to the extent of the varices and dissect out the saphenous vein. I ligate the proximal end, apply a clamp to the distal end and divide the vein. An assistant holds the vessel while I introduce into it a small olive tipped glass tube connected by a rubber tube to a syringe filled with the iodide solution."

In 1916 Homan's paper on varicose veins and ulcers appeared. Under etiologic and pathologic aspects, he pointed out that conditions causing high intra-abdominal pressure, pregnancy, congenital defects and phlebitis, also caused varicose veins. (Fig. 9.) Homans

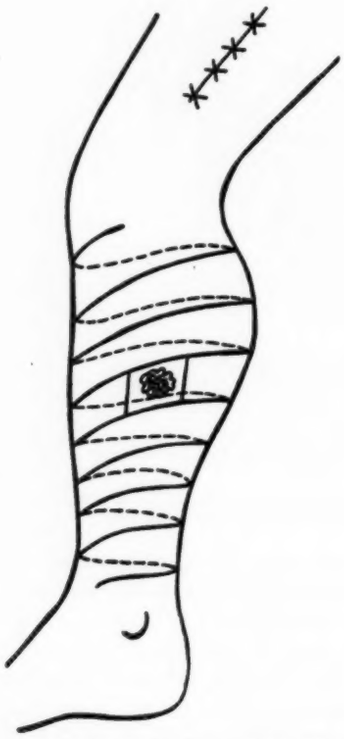

FIG. 8. The *Spiralschnitt* of Rindfleisch and Friedel, 1908.

described his method of operating as follows:

"A transverse incision several inches long is made in the groin about an inch below Poupart's ligament. Through this incision the great saphenous vein is divided at the fossa ovalis. At the same time any other veins which parallel it or enter from above are found and divided in order to do away with any vessels capable of reestablishing a large single, collateral trunk. The internal saphenous vein is then dissected out with the Mayo stripper or other appropriate means down to the region just below the knee. At this point open dissection should begin, for here the larger branches of the great vein begin to enter it, and though breaking the long column of blood by removal of the internal saphenous from groin to knee is likely in many instances to cure, it is always advisable carefully to dissect out the varicose vessels of the calf down to the point where they appear small and harmless. This is most easily done by a long incision to the deep fascia, turning back thick flaps of skin and fat, and dissecting the veins from inside the flaps." (Fig. 10.)

He also recommended the removal of all incompetent communicating veins and excision

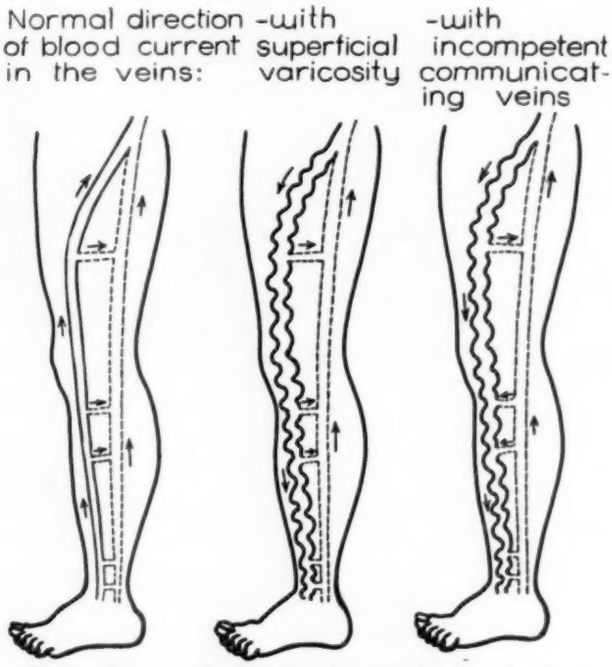

FIG. 9. Diagram by Homans in 1916 showing the circulation of blood in the veins of the lower extremity in the normal state and in the varicose state.

of the lesser saphenous vein when it was varicosed.

Injection Period (1916–1933). Following the discovery of Linser in 1911 that the veins of patients being treated for syphilis with mercury bichloride became thrombosed, the method of chemical obliteration of varicose veins was developed and became popular in France. The high rate of mortality from pulmonary embolism after the operative treatment[4] and the comparative safety of the injection method[5] made this course inevitable. Homans, for example (1934), reported three deaths from pulmonary embolism after operations for varicose veins on 162 patients.

Homans (1916, 1922, 1928, 1929, 1934) continued to hold out against treatment of varicose veins by injection, advocating his operation as described in 1916. His operation as described in 1927 was essentially the modern operation of

[4] Bernsten; McPheeters (1927 and 1929).
[5] McPheeters (1929); von Kettel.

today with the exception that patients today are ambulatory.

I shall not attempt to deal with the papers on treatment by injection except to refer to McPheeters' writings (1927, 1928, 1929, 1930, 1931, 1943), Meisen's book and Warwick's book. Reference to Figure 1 will show that the injection method became popular during this period and physicians gave up operating for varicose veins. McPheeters wrote in 1929 "For the past three years the author has used the injection treatment of varicose veins in preference to the operative treatment."

In 1927 Moskowicz combined ligation and retrograde injection, with the patient ambulatory: "I have combined the injection treatment with ligature of the vein, as it is done by most surgeons (Tavel, Streissler, Lotheissen, Schanz). In order to keep the operation at a minimum so that the patient could be ambulatory I have not performed the high ligation at the entrance of the vena saphena into the femoral vein but at the highest point of the enlarged vein. I have not gone above the middle third of the thigh and believe that in those cases where the varices reach the groin that the patients should not be treated as ambulatory cases."

Moskowicz injected 10, 20 or 40 cc. of a concentrated solution of sugar into the distal stump of the severed saphenous vein.

Unger in 1927 used a catheter to place the sclerosing solution in the vein. He wrote: "I expose the vena saphena close to its origin, section it and introduce a ureteral catheter into the distal segment. With large vessels that are not thrombosed the catheter usually can be inserted to a hand's breadth below the knee-joint, at times to the lower third of the leg. While the catheter is slowly withdrawn a 20% solution of salt or sugar is injected; about 1 to 2 c.c. for every 5 to 10 cm. of vein. Since the injection is sometimes painful one can inject 10 c.c. of a 1% solution of novocaine.—The patient remains in bed for 2 days and then is ambulatory using an elastic bandage for four weeks."

In 1929 deTakats reported on the ligation of the saphenous vein in ambulatory patients, in selected cases preliminary to injection, and again in 1930 and in 1931 he reported on 150 patients so treated. However, in the paper of 1931 deTakats wrote, "In most cases, however, and this must be emphasized, the injection treatment alone gives excellent results."

It was gradually becoming apparent that treatment of varicose veins by injection was insufficient, as the paper of Howard, Jackson and Mahon clearly proved. The treatment of varicose veins by injection fell into disuse in 1933 with the publication of deTakats and Quillin's

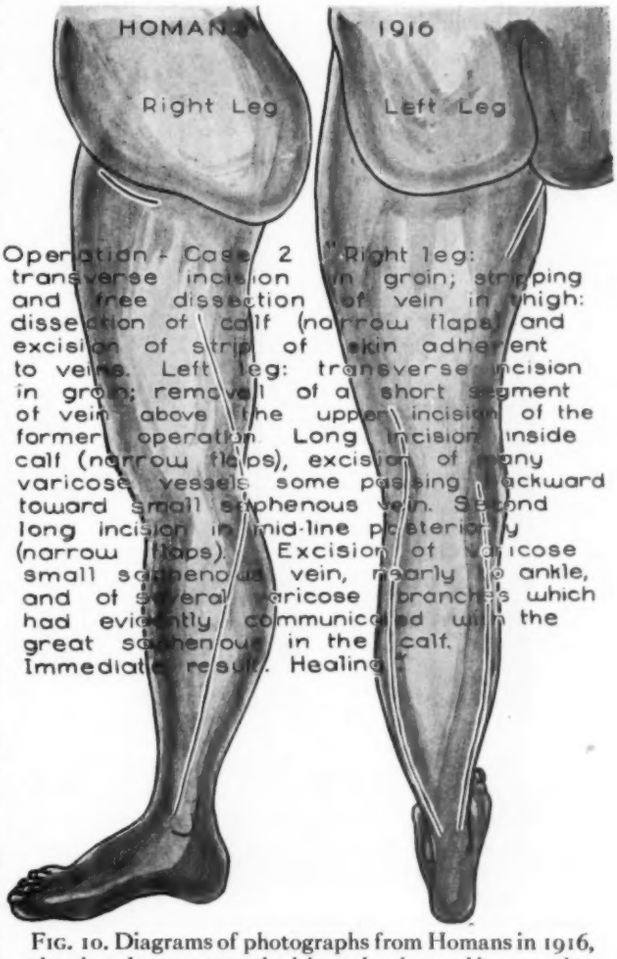
HOMANS 1916
Right Leg
Left Leg
Operation - Case 2 "Right leg: transverse incision in groin; stripping and free dissection of vein in thigh: dissection of calf (narrow flaps) and excision of strip of skin adherent to veins. Left leg: transverse incision in groin; removal of a short segment of vein above the upper incision of the former operation. Long incision inside calf (narrow flaps), excision of many varicose vessels some passing backward toward small saphenous vein. Second long incision in mid-line posteriorly (narrow flaps). Excision of varicose small saphenous vein, nearly to ankle, and of several varicose branches which had evidently communicated with the great saphenous in the calf. Immediate result. Healing."

FIG. 10. Diagrams of photographs from Homans in 1916, showing the cutaneous incisions that he used in removing the varicose veins.

paper. While deTakats' operation was not as high or as thorough as it could have been ("The line of incision in high saphenous ligations runs about a hand width distally and parallel to Poupart's ligament."), it served to start the treatment of varicose veins in the right direction; it was essentially the procedure advocated by Moore in 1896.

Ambulatory, Injection and Operation Period (1933–1938). This period is characterized by the feature that saphenous ligation was used only in selected cases and as a preliminary to treatment by injection. For example, deTakats

and Quillin stated that high ligation of the saphenous vein was contraindicated: "(1) when the vein is not involved above the knee, (2) when there are multiple incompetent valves in the communicating branches which cannot all be ligated and (3) when there is evidence of insufficient deep venous return owing to an old deep phlebitis or a deep valvular insufficiency." Only gradually did it begin to dawn on some physicians that the small branches at the saphenofemoral junction played an important role in producing recurrences after ligation of the saphenous vein. Edwards in 1934, while pointing out some important anatomic features, underestimated the role of these small veins. They were not properly understood by Howard, Cooper, Ferguson (1935) or Fantus. More thorough dissection and ligation of the branches at the fossa ovalis was insisted on by Levenson, Gillespie, Swinton, Willauer, Ochsner and Mahorner, Zimmerman, Haggard and Kirtley, Faxon, and Hawkes and Borsher. Retrograde injection at the time of ligation was practically universal[6] and even Homans was using retrograde injection by 1937.

11A 11B

FIG. 11. Drawing from the material of Faxon and Barrow of 1938, concerning the causes for recurrence of varicose veins following high saphenous ligation. A, ligation at fault, 39 per cent; B, ligation okay, incompetent communicating branch, 46 per cent.

Treatment by injection as a supplementary agent was falling into disuse. Besides being ineffective and causing bad cosmetic results, other dangers such as anaphylactic reactions,[7] phlebitis,[8] arterial impairment[9] and pulmonary embolism[10] were encountered during the treatment of varicose veins by injection.

1. Ulceration healed 6 weeks
2. Saphenofemoral dissection, interruption of superficial femoral; interruption of short saphenous
3. After 6 weeks: under spinal anesthesia the dissection of the medial communicating veins is carried out. Posterior plaster splint applied. Kept in bed 2 wks.
" I protect these patients with penicillin both pre- and post-op. The patients on whom I have done this radical type of surgery have done extraordinarily well and, I think, anything short of this is apt to end in recurrence."

FIG. 12. The Linton operation, 1938 to 1946. The present operation differs from that described in 1938 in that only the medial incision, as shown, is now used; the femoral vein distal to its profunda branch is ligated and penicillin is used. This operation is designed to remove the incompetent communicating veins associated with the postphlebitic syndrome.

[6] Edwards; Howard; Levenson; Gillespie; Fantus; Swinton; Willauer; Ochsner and Mahorner; Zimmerman; Johnston; Haggard and Kirtley; Faxon.

[7] Cogswell and Thomas; Dobson; Glasser (1938); Golden and Heyerdale; Hatcher and Long; Hawkes and Hewson; Lewis (1936); Meyer; Zimmerman.

[8] deTakats (1945); Jacques; Lyall; McPheeters (1945); McPheeters (1943).

[9] Atlas (1943); Kilbourne; Tunick and Nach.

[10] Atlas (1943); McPheeters and Anderson; Smith; Vaughn and Lees.

However, as late as 1937 McPheeters, Merkert and Lundblad were still reluctant to abandon the method: "The injection treatment of varicose veins has long been accepted as the most rational method of caring for this malady."

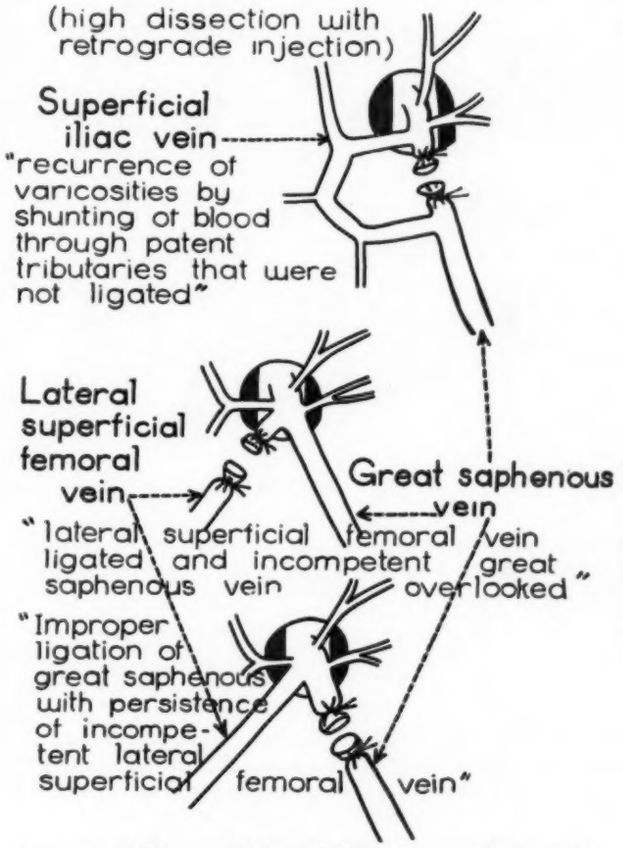
(high dissection with retrograde injection)
Superficial iliac vein
"recurrence of varicosities by shunting of blood through patent tributaries that were not ligated"
Lateral superficial femoral vein
Great saphenous vein
" lateral superficial femoral vein ligated and incompetent great saphenous vein overlooked "
"Improper ligation of great saphenous with persistence of incompetent lateral superficial femoral vein"

FIG. 13. Stalker and Heyerdale in 1940 emphasized the part that the superficial femoral veins play in the recurrence of varicose veins.

Lowenberg in 1937, in addition to high saphenous dissection and retrograde injection, emphasized the excision of all incompetent communicating veins in the thigh and the leg.

Ambulatory Operative Period (1938–1951). This period is characterized by accentuation on the operative removal of the varicose veins, with diminution in the employment of sclerosing chemicals. Besides the importance of doing a high saphenous dissection carefully, i.e., ligating and dividing all of the venous tributaries at and around the fossa ovalis, the value of excising the communicating veins in the thigh and the leg has become evident.

Retrograde injection at the time of operation no longer plays an important part in the procedures of Swinton (personal communication, 1946), Adams (1942), Freeman, Harkins and Schug, Ferguson (1935) and Dunlop. Retrograde injection has been in use by Sarma (1938), Faxon and Barrow, McPheeters (1938, 1945), Mahorner and Ochsner (1938), Pratt

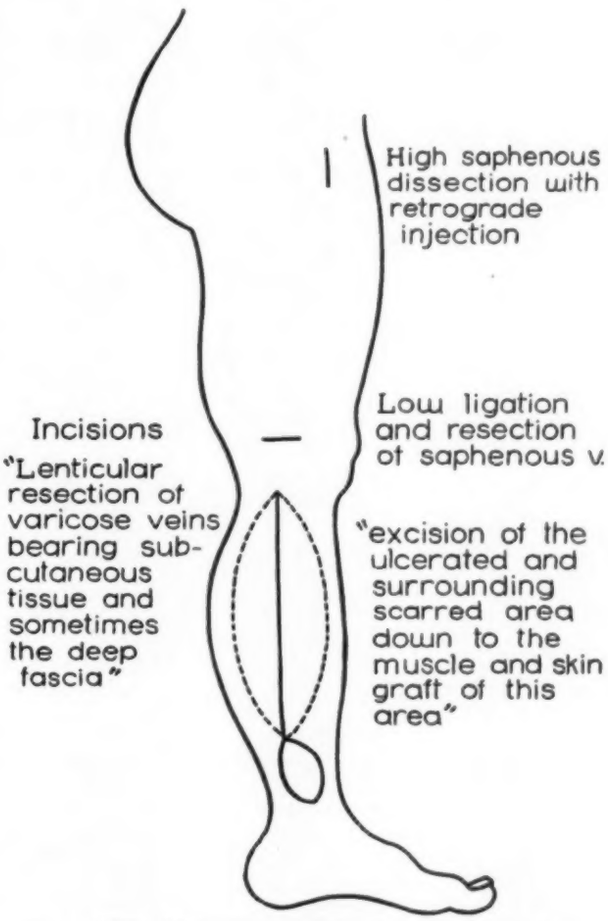
High saphenous dissection with retrograde injection
Low ligation and resection of saphenous v.
Incisions
"Lenticular resection of varicose veins bearing subcutaneous tissue and sometimes the deep fascia"
"excision of the ulcerated and surrounding scarred area down to the muscle and skin graft of this area"

FIG. 14. The Mahorner operation, in 1941, for varicose veins and ulcers associated with postphlebitic syndrome.

(1939, 1943), Rakov, the men of the Mayo Clinic,[11] Sears and Cohen, Hawkes and Hewson, Mahorner, Duncan, Pearce, Homans (1944), deTakats (personal communication, 1946), Smithy, Lyall and Babington.

The necessity for removing as much of the saphenous vein as possible and for the excision of all incompetent communications in the thigh and the leg, in addition to a carefully done high saphenous dissection, is emphasized by Horgan, Faxon and Barrow, Freeman, Sarma (1941),

[11] McCallig and Heyerdale; Smith; Heyerdale and Anderson; Heyerdale and Stalker; Waugh; Larson and Smith.

Duncan, Harkins and Schug, Harkins (personal communication, 1946), Ferguson (1942), Pratt (1943), Sherman (personal communication, 1946), Hodge, Grimson and Schiebel, and Sapiro. As Homans stated in 1946, the operations of Sherman, Sapiro and Hodge, Grimson

Sufficient data has been collected on variations in the saphenous system,[12] the communicating veins[13] and the valves in the veins of the lower extremity[14] to leave surgeons little excuse for recurrence after a thorough operation. (Figs. 12 to 20.)

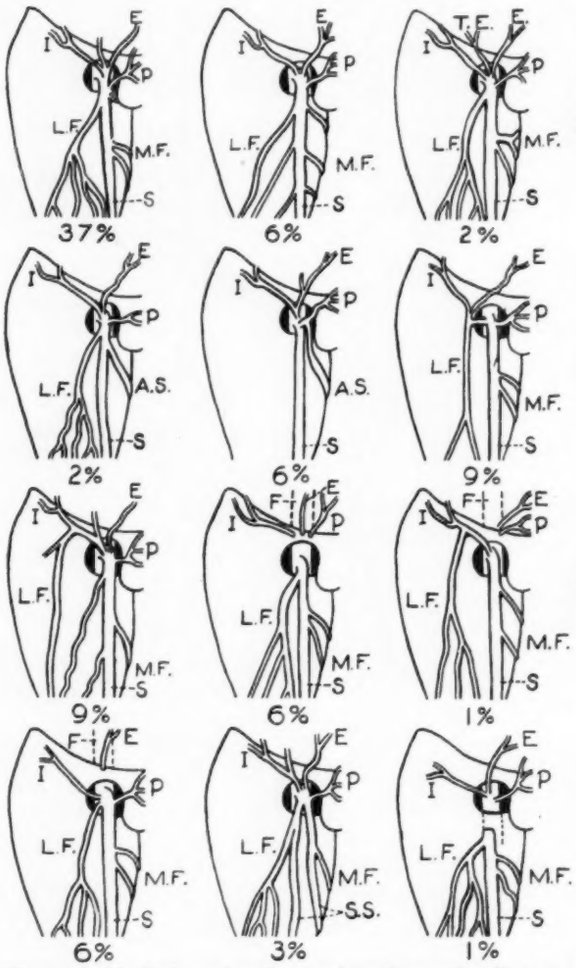

FIG. 15. Variations in the saphenofemoral tributary veins as dissected by Glasser in 1943. E, superficial epigastric vein; I, superficial circumflex iliac vein; P, superficial external pudendal vein; T.E., superficial thoracoepigastric vein; S, great saphenous vein; L.F., lateral superficial femoral vein; M.F., medial superficial vein; A.S., accessory saphenous vein; S.S., duplication of the main saphenous trunk.

and Schiebel have swung the circle of varicose vein therapy back to the radical procedures of the past with, I should add, one important new feature, ambulatory treatment of the patient. Enough evidence has already been given to substantiate this latter important point, but I shall add that Moore and Knapp in 1942 reported on three patients with pulmonary embolism, in two of whom it was fatal, among 178 patients upon whom operations for varicose veins were performed; the patients being kept in bed from three days to two weeks postoperatively. (Fig. 11.)

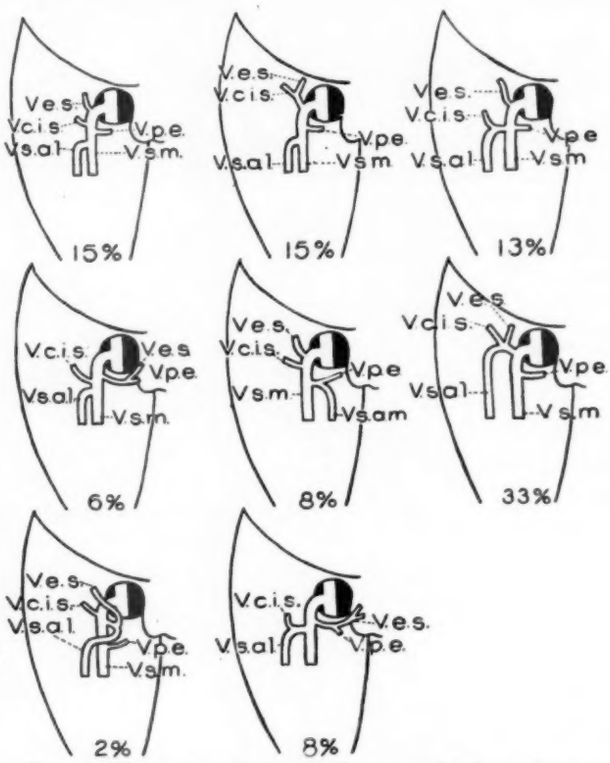

FIG. 16. The saphenofemoral tributary veins from dissections by Daseler, Anson, Reimann and Beaton in 1946. V.c.i.s., vena circumflex iliaca superficialis; V.e.s., vena epigastrica superficialis; V.p.e., vena pudenda externa; V.s.a.l., vena saphena accessoria lateralis; V.s.a.m., vena saphena accessoria medialis; V.s.m., vena saphena magna.

From what has gone before and from various studies on the circulation of blood in the lower extremity[15] it would seem that degeneration of varicose veins once begun is progressive and should be treated with thorough isolation, if not extirpation, of the superficial venous systems from the deep venous system, the results of various tests (Trendelenburg, Perthes, McPheeters' percussion test, Mahorner-Ochsner comparative tourniquet test, Pratt test [1941] and Harkins test) notwithstanding. A

[12] Anson and McVay; Daseler, Anson, Reimann and Beaton; Edwards (1934); Faxon and Barrow; Glasser (1943); Sherman; Stalker and Heyerdale (1940).

[13] Braune; Edwards (1934); Faxon and Barrow; Hesse and Schack; Loder; McPheeters and Anderson; Warwick; Sherman; Linton; Rakov; Spalteholz; Meisen; Willauer.

[14] Eger and Casper; Hesse and Schack; Homans (1945); Klotz; Warwick.

[15] Adams; DeLee; Heller; Lake, Pratt and Wright; Veal and Husse.

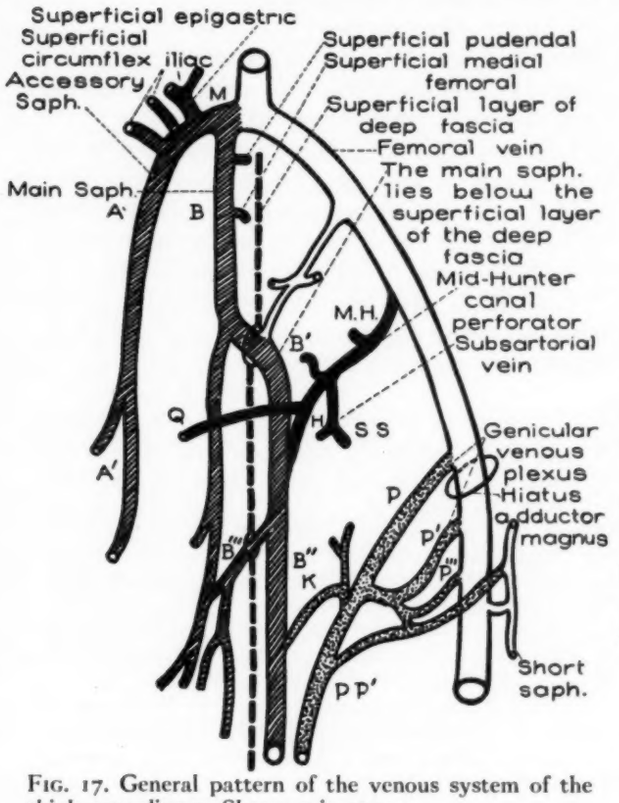

FIG. 17. General pattern of the venous system of the thigh according to Sherman in 1944.

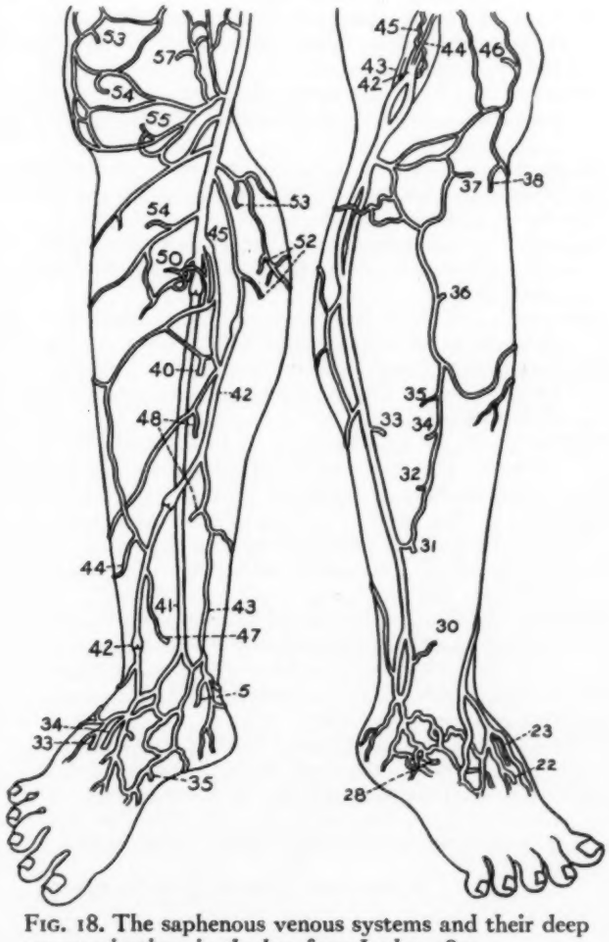

FIG. 18. The saphenous venous systems and their deep communications in the leg, from Loder, 1803.

test that probably should be used before operation in these patients who have had phlegmasia alba dolens is the one designed by Mayo in 1906, and redescribed by McCallig and Heyerdale in 1941, to test for the patency of the deep veins.

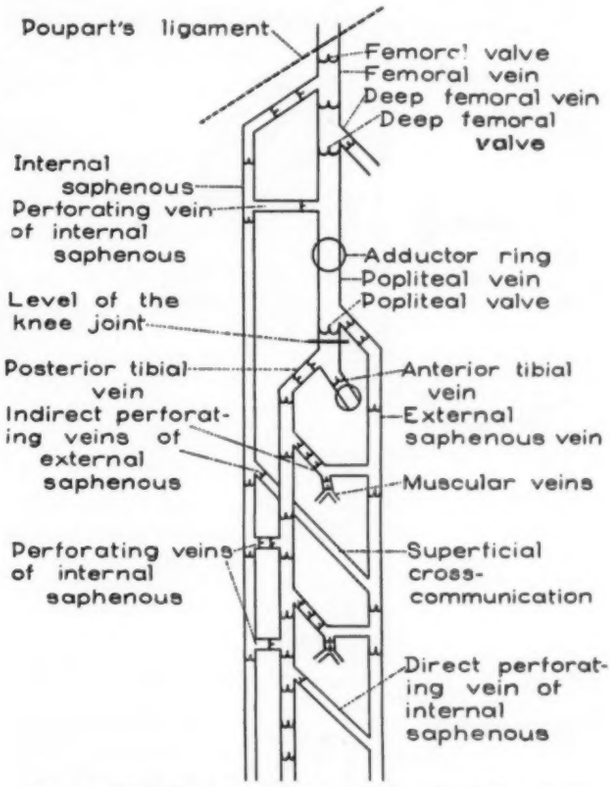

FIG. 19. The plan of the venous system of the lower extremity, with the location of the principal valves, according to Warwick, 1931. Drawing shows the location of the important valves in the veins of the lower extremity from study of twenty-eight young, non-varicosed subjects.

The definitive treatment for varicose ulcers is the removal of the varicose veins and their incompetent communicating branches, but temporary healing of varicose ulcers is attained with those measures which prevent stagnation of blood in the veins, such as putting the patient to bed with the leg elevated or the wearing of compression dressing,[16] the Unna paste boot (Unna, 1885) being the most efficient compression dressing of all.

Acute thrombophlebitis in the saphenous vein is best treated with immediate ligation of the saphenous vein, with the patient remaining ambulatory,[17] but may be treated with elastoplast pressure dressings (Homans, 1937). In either case, it is a mistake to put the patient to bed.

[16] deTakats (1946); Holmes and Smith; Homans (1922); Ochsner and Mahorner (1939); McPheeters and Merkert.

[17] Babcock; Babington; deTakats (1930); deTakats and Quillin; Edwards (1938); Jensen.

SUMMARY

A historical survey of the treatment of varicose veins is given.

The best treatment for varicose veins and varicose ulcers is shown to be the removal of the varicose veins and, especially, of the incompetent communicating veins. This can be accomplished only by surgical means.

The site of operation on varicose veins has gradually become higher on the leg until it has reached the fossa ovalis, and with that level attained, some time has been required for the recognition of the importance of all the small veins at the saphenofemoral junction in causing recurrences of the varices.

Obsolete methods, such as local attack on varicosities in the leg, percutaneous ligations, neglect of the incompetent communicating veins and the use of ointments in the attempt to heal varicose ulcers, are still in use.

It is likely that treatment of varicose veins with sclerosing chemicals will be abandoned altogether in the near future.

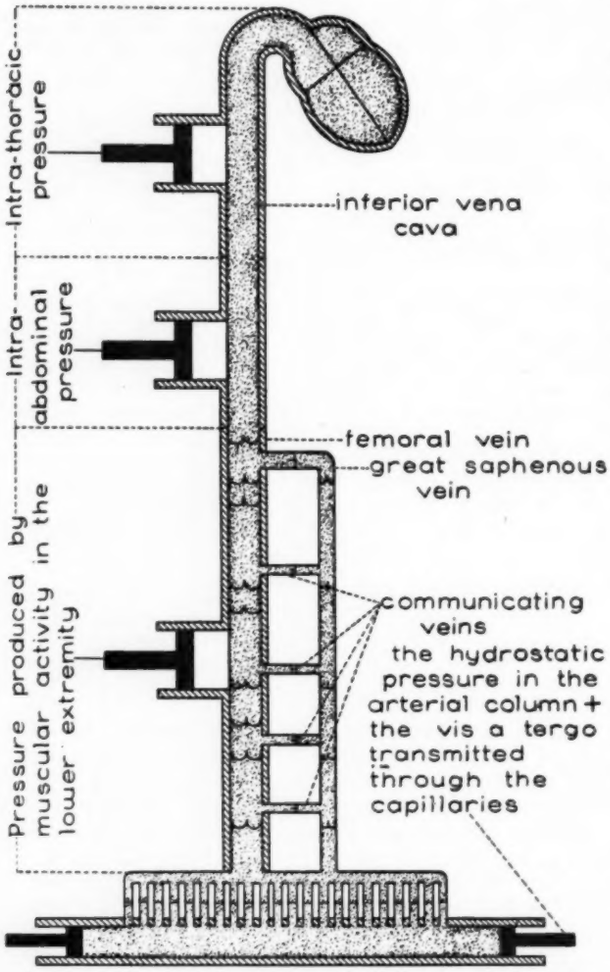
Intra-thoracic pressure
Intra-abdominal pressure
Pressure produced by muscular activity in the lower extremity
inferior vena cava
femoral vein
great saphenous vein
communicating veins
the hydrostatic pressure in the arterial column + the vis a tergo transmitted through the capillaries

FIG. 20. Diagram illustrating the factors involved in the return of the venous blood from the lower extremity, modified from Heller, 1942. The deep veins of the lower extremity are supported by the surrounding muscles and fascia. The superficial systems of veins (greater and lesser saphenous) lie in the subcutaneous tissue. Therefore, an increase in intra-abdominal pressure, transmitted down the external iliac and femoral veins, expends itself by dilating the great saphenous vein.

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Practical Surgical Suggestions

PLEURAL TUNNEL FOR THORACIC DRAINAGE TUBES*

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CLOSED drainage of the pleural cavity is still a useful procedure, particularly following lobectomy to facilitate complete expansion of the remaining lobes. We customarily use a fenestrated tube or catheter for this type of drainage through the inferior, lateral or posterior wall of the thorax. In the past these tubes were attached to the pleura with sutures for proper placement and in order not to interfere with expansion of the lung. However, more recently another method for holding the tube in place has been found useful. (Fig. 1.)

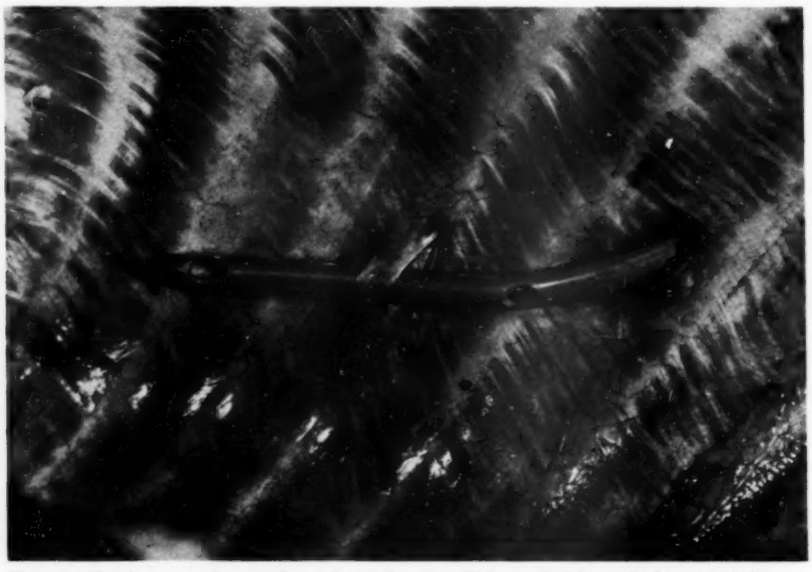

FIG. 1. Drainage tube anchored to chest wall by a bridge of elevated pleura.

Two short, parallel incisions 1 cm. apart are made through the pleura, the inferior incision being placed over an underlying rib. The pleura is then gently elevated and the drainage tube is threaded beneath it. As many of these pleural tunnels as necessary can be made, but usually one suffices and more than two are rarely needed. The incisions in the pleura should not be too long in order to preserve the width of the tunnel since the pleura becomes twisted and thread-like when long incisions are made. The inferior incision should be situated over the rib in order to avoid difficulty in guiding the tip of the catheter beneath the pleura. The procedure is more successful when the openings in the catheter are not excessively large.

There are several advantages to this type of procedure: It is very simple and requires only a few minutes to perform, no foreign material is left within the pleural cavity, the patient has less pain when the tube is removed, and the danger of tearing the underlying tissue with bleeding is avoided. The fenestrations in the catheter beneath the pleura act as a sump drain facilitating expansion of the lung, and the tube may be retained in place accurately by means

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of any desired number of pleural bridges over the catheter.

The distal end of the tube is passed through an intercostal stab wound, anchored by means of a silk suture placed in the skin and tied with a square knot. The suture then is used to encircle the tube and finally is tied with a double surgeon's knot. Vaseline gauze applied to the skin surrounding the tube insures an airtight closure. The suture is cut distal to the square knot when the tube is to be removed. It slips out with minimal discomfort to the patient and the remaining portion of the suture retains the apposed skin edges in proper position.

SUMMARY

A simple method of threading a tube beneath pleural bridges for accurate localization and minimal pain on removal has been described for cases in which closed drainage of the pleural cavity is instituted following thoracotomy.

ROUTINE chest films taken to detect tuberculous disease have detected many early and symptomless cases of bronchogenic carcinoma, especially in patients after the age of forty. One in 500 will present radiographic evidence of a chest tumor. Since the cost of each routine chest x-ray taken in cities is less than one dollar, it seems all adults should have one yearly. Before producing clinical symptoms bronchogenic carcinomas are usually resectable, only one-fourth exhibiting lymphatic spread. The prognosis, therefore, is much better. About 90 per cent of the symptom-producing tumors are already inoperable. (*Richard A. Leonardo, M.D.*)

NEW BREAST FORM FOR MASTECTOMY PATIENTS

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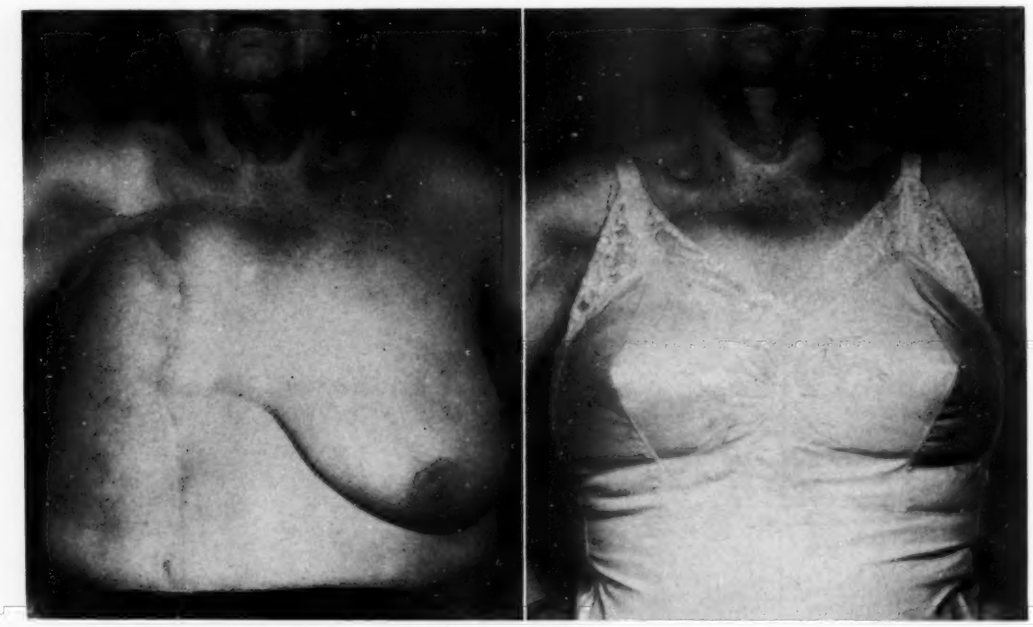
EACH year more than 50,000 women in the United States face the problem of how to look and feel normal after a mastectomy. Surgeons have long recognized the importance of a comfortable, well fitting prosthesis as necessary to the rehabilitation of these patients. The sooner these women resume their normal interests and activity, the more rapidly they recover, both physically and mentally. Nothing demoralizes these patients more than the thought of facing life knowing they look and feel "different." Unfortunately, until recently a completely satisfactory breast prosthesis was not available. Most of these breast forms were sculptured of sponge rubber, kapok or similarly dry and immobile materials whose textures were totally unrelated to the composition of the normal soft tissue of the human body. They therefore could not conform to the constantly changing contour and position of the remaining breast. In addition, they lacked the necessary weight to fix the breast form in normal position and restore the patient's sense of physical balance. This absence of a balancing weight was responsible for the embarrassing tendency of these forms to "ride up" on the denuded chest wall, and thereby actually served as a constant depressing reminder of the patient's mutilation. In attempting to overcome the problem it was necessary to pull the form down forcefully and anchor it to a girdle. Invariably this caused the brassière strap to cut in at the shoulder region, thus seriously interfering with an already impaired circulation.



FIGS. 1 and 2.

These inherent disadvantages have been automatically overcome by a surprisingly simple breast prosthesis.* This form, designed specifically for the use of mastectomy patients, not only achieves an excellent cosmetic result but also meets the patient's previously overlooked physiologic needs. It succeeds in realistically simulating normal breast tissue because its construction takes into consideration two known scientific facts: (1) that two-thirds

* Identical Form, manufactured by Identical Form, Inc., New York, N. Y.

of the normal body weight consists of water and (2) that, generally speaking, the glandular breast tissue is not imbedded in adjacent muscular tissue but is suspended closely beneath the skin and kept relatively loosely in position by fibrous tissues, etc. For this reason the breasts are readily affected by the law of gravity and so change their contour and position with every body motion. For instance, when a woman lies down, her breasts shift laterally. When she is in a standing position, they assume a lower level on the chest wall than when sitting; and when bending forward, they fall freely away from the chest wall.

To duplicate this fluidity of motion, the identical breast form departed radically from the customary type of prostheses. It consists of a double cell structure fabricated of a soft, skin-like plastic film. The inner cell contains a slow-flowing creamy fluid, while the outer cell serves as an additional safety device. Carefully underinflated, the identical breast form allows a free flow of the liquid within the cell and is therefore affected by gravity in precisely the same manner as is the remaining breast. Then, too, the underinflation enables this form to change its contour and position in automatic response to the patients' body motion. An underarm extension compensates for the loss of the adjacent muscular and glandular tissues without inflicting any pressure. It will conform to the outline of any well fitting brassière, bathing suit or foundation garment to which the patient is accustomed. Its scientifically balanced weight replacement entirely eliminates the need for forceful hooking down; nor does it require the undue pressure of overly tight-fitting garments to keep it in normal alignment with the remaining breast. Equally important, the precisely coordinated weight overcomes the postoperative tendency to carry the affected shoulder higher. The restored balance assists in maintaining level shoulder carriage and re-establishes normal weight distribution in relation to the body's anatomic center of gravity as well. This aspect of the form is stressed because its absence leaves the patient with a sense of physical unbalance and instability which in turn may develop a feeling of mental insecurity and anxiety. (Figs. 1 and 2.)

Unless coinciding disease exists, patients welcome the equalized weight replacement as it relieves their feeling of lopsidedness. They experience it not as a static weight, but as a natural and life-like replacement of the removed breast.

Even on very close contact this prosthesis is indiscernible for it is capable of assuming body temperature. This is an added source of confidence to those whose desire for concealment has become almost an obsession.

A wide range of sizes, twenty-three to be exact, makes it possible to fit every type of figure. The moderate price brings it within the reach of the average patient.

There are other vitally important factors which belong within the scope of a well rounded rehabilitation program for the mastectomy patient, but the need for a realistic and comfortable prosthesis cannot be overlooked as an important adjunct to postoperative treatment.

Case Reports

TURNBUCKLE CAST FOR REDUCTION OF WIDE SEPARATION OF SYMPHYSIS PUBIS*

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SEVERAL methods are available for reducing fracture dislocations of the pelvis with separation of the symphysis pubis.

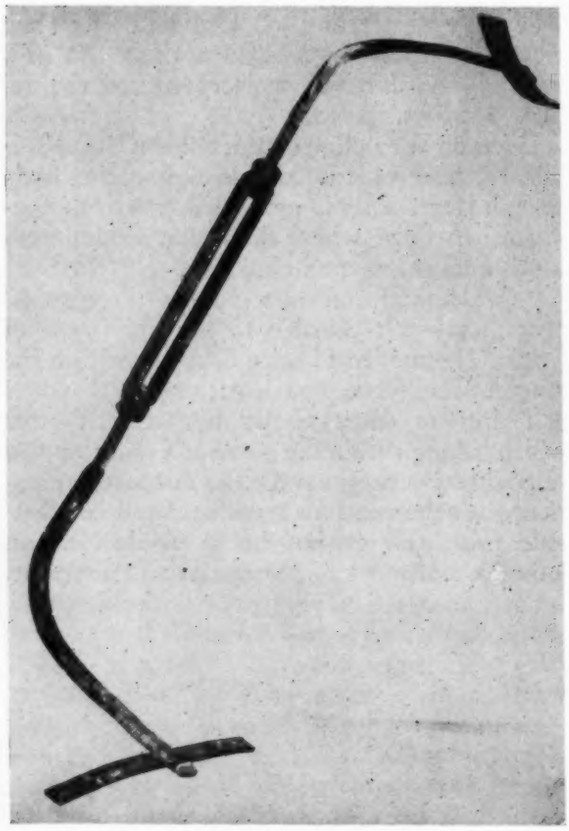


FIG. 1. Case 1. Shows the type of turnbuckle used.

These include manual manipulation, pelvic slings or suspension cradles, and turnbuckles with or without plaster immobilization. They all utilize compression directed medially toward the injured pubis. Fresh fractures are usually easily reduced. However, after several weeks of separation the symphysis pubis is not easily realigned. Such cases require a more prolonged form of treatment, with constant forces acting to overcome existing deformities, and requiring adequate immobilization of the pelvis.

In 1938 Narat[1] reported a metallic pelvic splint which applied a constant compressing force through the iliac bones. The pressure was increased gradually by turning two lateral screws which forced attached metal clamps closer together across the plane of the iliac alae.

Jahss[2,3] described a plaster-turnbuckle method of reducing dislocations and fracture dislocations of the pubic bones. He utilized two toe-to-groin plaster casts and three turnbuckles. One turnbuckle was anchored to both casts just proximal to the medial malleoli, and the other two were placed about 4 inches from the proximal end of the casts. The upper pair were 4 inches apart, one being anterior and the other posterior, on the medial side of the thigh. By closing the upper two while opening the distal turnbuckle, compression across the pubis was obtained. Dudgeon[4] reported several cases successfully treated by the Jahss method.

We have treated two cases of separation of the symphysis pubis by means of turnbuckle-plaster casts in slightly different fashion. This device assures immobilization of the pelvis with constant reducing compression and obviates injury to the superficial soft tissues.

CASE REPORTS

CASE 1. A twenty year old white man was admitted to Wadsworth Hospital on July 20,

* From the Orthopedic Service, Wadsworth Hospital, Veterans Administration Center, Los Angeles, Calif. Reviewed by the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions of the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration. This article was presented at the Western Orthopedic Convention, Coronado, Calif., October, 1952.

1948, with a fracture of the descending ramus of the right pubic bone and a 5 cm. separation of the symphysis pubis. There were also fractures of the right femur, right tibia and fibula, and left tibia and fibula. These had been sustained on July 11th in an auto accident. The patient had been treated elsewhere by open reduction of the leg fractures with metallic screw fixation, followed by a right hip spica, and a left long-leg cast.

Two days after admission, and eleven days after the injury, the spica was removed and the patient was placed in a pelvic sling with skeletal traction through the right distal femur. Four weeks later the pubic separation had been decreased to 2.5 cm. from the original 5 cm. Because of the associated lower extremity fractures the patient was placed in a bilateral plaster hip spica with a 3 inch section removed from its anterior portion so that turnbuckle compression could be applied through the iliac bones. (Fig. 1.) Because of the leg fractures it was necessary to maintain the extremities with minimum rotation deformity. Therefore an antirotation bar was incorporated in the plaster and fixed below the knees, holding the lower extremities in fixed abduction. (Fig. 2.) The turnbuckle was anchored with plaster over the iliac alae and gradually closed over a period of two months. At this time there was excellent alignment of the pubic bones, with 11 mm. separation. (Fig. 3.)

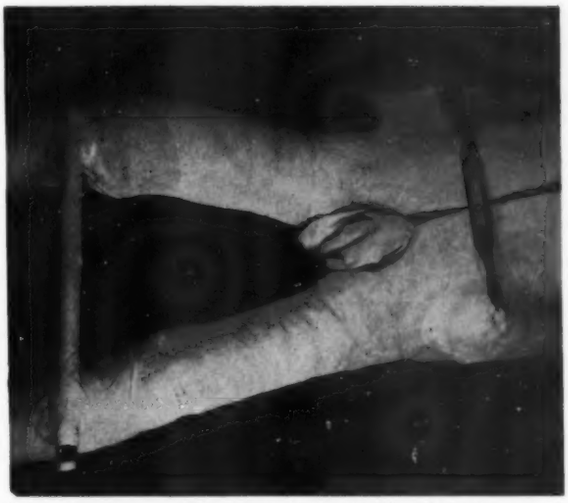


FIG. 2. Case 1. The anterior split in the plaster is almost closed and the antirotation bar is in position.

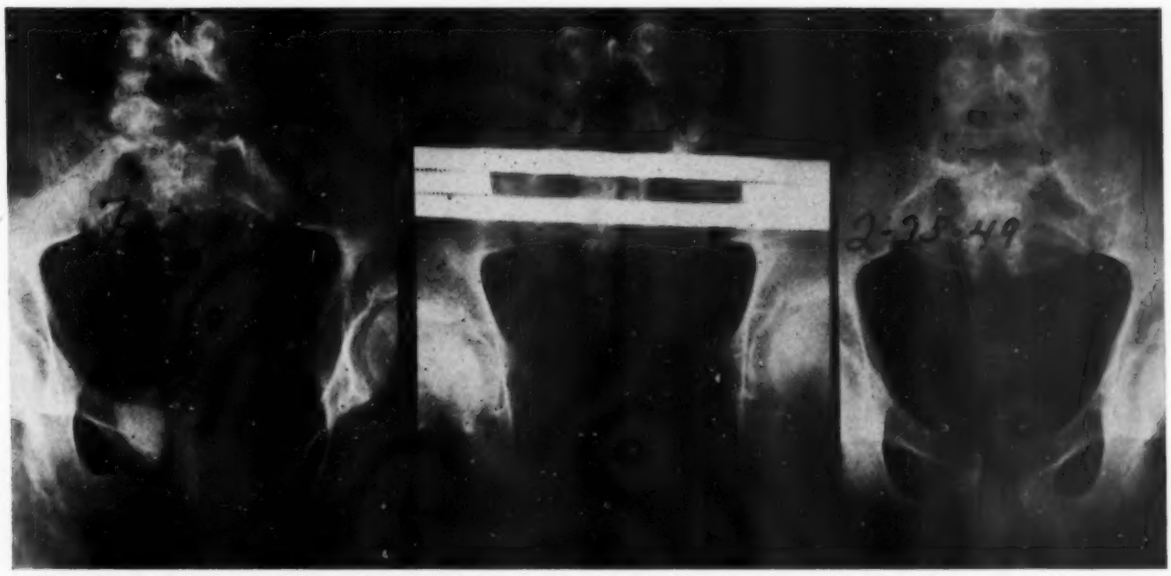


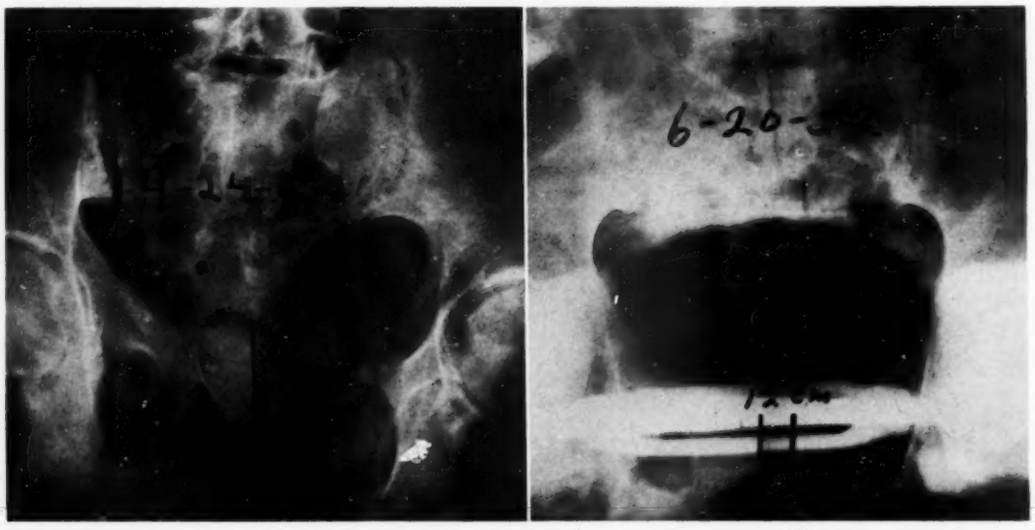
FIG. 3. Case 1. Left: shows disruption of the left sacroiliac joint and a 5.2 cm. separation of the symphysis. Center: the turnbuckle in place with partial closure. Right: closure of the symphysis to 1.1 cm.

Follow-up examination at our Outpatient Clinic four years after injury revealed that the separation of the symphysis pubis had been maintained at 11 mm. The patient was asymptomatic and working a full day at heavy labor.

Because this type of reduction did cause some skin necrosis and superficial ulceration over the iliac bones, a pantaloon type of turnbuckle-plaster cast was used for the second patient, and this appears to offer definite advantages over any previously reported method. The reducing force in this case was one of rotary compression, with no single area subjected to direct compression.

FIG. 4. Case II. The turnbuckles in place. The blacked-out portion of the cast indicates the area of plaster to be removed prior to closure of the turnbuckles.

mately 4 inches above the patellas. The cast differed from the usual by the incorporation of felt pads and sponge rubber between the layers of plaster overlying the iliac alae and greater trochanters. Also, after several layers of plaster had been wrapped, a second felt pad was placed directly over the midline posteriorly in the longitudinal axis. Four plaster mounds were constructed, two in the plane of the iliac crests and two in the plane of the greater trochanters, their placement being determined by the measurements previously recorded. (Fig. 4.) The mounds were not incorporated directly into the cast but were attached by strips of plaster fastened posteriorly so that the pull by the turnbuckles created a rotary compression



5A 5B

FIG. 5. Case II. A, shows a 4.0 cm. separation of the symphysis before the inception of treatment; B, the separation is now reduced to 1.5 cm.

CASE II. A forty-five year old white man was admitted to Wadsworth Hospital on April 24, 1952, with a 4 cm. separation of the symphysis pubis, rupture of the membranous urethra and fracture dislocation involving several of the bones in the left foot. These had been sustained in a motorcycle accident two months before admission and treated initially elsewhere.

Prior to placing the patient in his turnbuckle-plaster cast the distance from each nipple to the homolateral iliac crest and greater trochanter was measured. This enabled us to place one turnbuckle over the iliac bones and a second over the greater trochanters. A well padded cast was then wrapped, extending from just below the rib cage laterally to approxi-

directed anteriorly and medially, with minimum direct compression through any single pelvic plane. The turnbuckles were then anchored in the plaster mounds with two longitudinal fixation bars. The patient thus received pelvic immobilization in plaster pants hinged posteriorly and open anteriorly, through which constant rotary compression was applied. Six weeks later the separation had been reduced from 4 to 1½ cm. (Fig. 5A and B) and concurrently the urethral tear had healed. During the six-week period of immobilization the patient had been able to move at will in bed, and by gurney. Ambulation was prohibited by the necessity of maintaining the left foot and leg in plaster because of the injury to this foot. At time of discharge three and a half

months after admission there was a 12 mm. separation of the symphysis pubis. The patient was ambulatory and asymptomatic. No soft tissue injury had resulted from his treatment.

SUMMARY

Two cases of separation of the symphysis pubis reduced by means of turnbuckles incorporated in plaster are presented.

The first reduction was accomplished by means of direct compression and the second by rotary compression. Both methods offer maximum immobilization of the pelvis and constant compression with restoration of anatomic continuity and function without necessitating complete bedrest, and thereby reducing the nursing care of the patient. The latter method, in addition, results in minimal trauma to skin and soft tissues.

Adequate padding of bony prominences and constant vigilance against the appearance of skin necrosis must be observed.

Turnbuckle-plaster treatment provides a means of reducing wide separation of the symphysis pubis in older injuries where other methods may fail.

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In older patients with peptic ulcer a massive gastrointestinal hemorrhage may prove fatal unless it is promptly stopped by surgery. LeVeen et al. have shown that the resultant shock is due to hypoxia of the liver, a progressive process initiated by reduction in the amount of blood going to the liver via the hepatic artery. This is accompanied by decreased oxygen tension in the portal vein; thus the liver receives insufficient oxygen. To prevent liver anoxia and its profound shock the surgeon must maintain the normal blood pressure by means of repeated transfusions and prompt surgery. (*Richard A. Leonardo, M.D.*)

FOREIGN BODY IN THE ABDOMEN CAUSING OBSTRUCTION*

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THE problem of retained foreign bodies after abdominal surgery is an old one. In spite of standard and well accepted precautions it will remain with us as a hazard in every abdominal procedure. Since Crossen and Crossen[1] published their classical work on this subject in 1940, I have been able to find six case reports similar to the one herein reported in this article, all of which occurred in the best of modern recognized hospitals. A gauze sponge was the most frequent offender, as was the case here found after thirty years of complete silence as to symptoms. In order of frequency in the literature of foreign bodies reported were sponges, small artery clamps, other small instruments, pieces of broken instruments or equipment such as irrigation sets, etc.

As early as 1884 Wilson[2] reported a case of his own of sponge left in the abdomen and collected thirty others in the literature. Crossen's work found 307 cases reported of the same up to 1940. The latter writers believed that it represented only a small fraction of occurrences because of the natural tendency for medicolegal and other reasons not to report them. In Crossen's collected series the mortality was 25 per cent.

R. D. Forbes,[3] of Seattle, in an article on this subject in 1948 states that less than 10 per cent are left in the upper abdomen where gallbladder operations preponderate in the case reports. Gynecologists are the greatest offenders in the literature reviewed. It is of significance in the latter connection that the case here described followed a bilateral salpingectomy and oophorectomy with apparently an uneventful recovery.

The usual fate of sponges inadvertently left in the abdomen will be briefly reviewed. Usually they make themselves manifest in the immediate postoperative period. This may be due to one or a combination of factors: infective inflammation, aseptic irritation, causing adhesions with resulting obstruction. The usual result of the first is abscess formation, and that of the latter, plastic exudate and encapsulation. Throughout all the case histories the tendency is to extrusion in the line of least resistance. Extrusion of the foreign body may fortunately carry it: (1) to the body surface and be detected by abscess formation or draining sinus: (2) to some relatively "silent area," as was the case later to be described, in the greater omentum, below the transverse colon, under the liver, or into the lumen of the intestine, vagina, rectum or bladder.

As to the duration for sponges being retained in the abdomen, it may be said generally that they are rarely retained over five years without urgent symptoms.

In 250 of 307 cases reviewed by the Crossens, a summary of events were as follows: (1) Twenty were removed on the first to second postoperative days. Usually the error was discovered by sponge count and the abdomen opened on the same or following day to remove it. (2) Thirty-seven were found at autopsy on the third to seventh day when the patient did not survive the original operative procedure or died of peritonitis. In rare cases they were found because of suppuration in the incision, drainage tract or at a secondary operation because of peritonitis. (3) Thirty-one were removed the second to fourth week by secondary operation because of suppuration in a closed incision, deep inflammation or because of a sense of a mass in the abdomen. At this time first reports of extrusion appear per rectum or vaginam. (4) Thirty-seven were removed during the second to third month. One-third were removed for persistent fistula or sinus. Another one-third were extruding themselves successfully by bowel or in the process of entering the bowel lumen. (5) One hundred twenty-five

* From the Queens General Hospital, Jamaica, N. Y. Read at the Nassau Surgical Society, East Hempstead, N. Y., September 15, 1952.

were removed after five years or more. Here secondary operations became more frequent, usually occasioned by serious intestinal disturbance or obstruction, or by inflammatory symptoms associated with a tender mass. The rarity of the case to be described will be seen from the fact that in only 14 per cent of Crossen's collected cases did the sponge remain hidden for over five years without symptoms requiring exploration.

The pathologic changes in and about the sponge found after five years in the abdomen, in addition to encapsulation, are in exceptional cases (1) calcification, (2) partial absorption and (3) breaking into pieces and diffusion.

The Crossens state that none of the encapsulated sponge cases studied, which developed calcium in the capsule, were outside the lumen of the bowel or bladder. Calcium encrustation was found practically in all cases extruded into the bladder. However, in the case to be described—adherent to the transverse colon at the time of surgery—no apparent fistulous communication with the lumen of the colon could be found; yet it had a dense fibrous and calcific shell visible by x-ray. Truemmer[4] found in his case in 1948 that there was calcification of the capsule over a retained sponge after cholecystectomy twenty-three years before with no bowel attachment or fistulous communication. Evidently then calcification in the fibrous capsule over a retained sponge can occur in the absence of communication with the bowel lumen.

At times sponge fibers resist distintegration and remain recognizable at all times as in my own case thirty years postoperatively and in Truemmer's case twenty-three years postoperatively.

Fortunately, breaking up of sponges and diffusion are extremely rare. In a case described by Upchurch[5] in 1933 the particles of the retained sponge had spread in various directions in the wound and into the bladder, requiring in all the incredible number of 102 major procedures under general or spinal anesthesia over a period of five years. Several fragments had been extruded from the bladder at varying periods up to six years.

CASE REPORT

This patient was a sixty-eight year old colored domestic, admitted to the Eye Service of the Queens General Hospital on June 9, 1951, for treatment of glaucoma of the right eye. While under treatment with local medication for the eye, she developed generalized colicky abdominal pain with vomiting. (Fig. 1.) A scout film of the abdomen June 15, 1951, revealed a normal gaseous pattern in the intestine and a round calcific density with a calcified periphery and translucent center in the left lower quadrant over the left sacroiliac articulation. Differential diagnoses offered by the roentgenologist were: (1) calcified fibroid; (2) calcified dermoid cyst.

Functional inquiry elicited that she had always had normal daily bowel movements and no history of melena or jaundice. There was no history of gallbladder disease. The urinary, gastrointestinal and cardiorespiratory systems elicited no symptoms. Thirty years before, at the age of thirty-eight years, she had had a bilateral salpingectomy and an oophorectomy as an elective procedure for pelvic inflammation. She had had two previous normal full term pregnancies but none since. Her menstrual periods up to eighteen years before had always been normal and regular. Careful inquiry elicited no history of unusual difficulty in her postoperative course and she was discharged on her fourteenth postoperative day, the wound soundly healed without drainage. She had remained well up to the time of this admission except for removal of a cataract in the same right eye in November, 1950 (the previous year). Examination showed the old iridectomy scar, acutely inflamed right cornea and a cloudy anterior chamber. Blood pressure was 140/80, pulse 80; heart sounds were good with no murmurs; the lungs were clear and the abdomen protuberant, measuring 35 inches in circumference at the umbilicus. There was a round, tender, movable mass, the size of an orange, in the upper left abdominal quadrant. There was an old lower midline scar below the umbilicus, showing no signs of weakness, old fistulous tract or evidence of previous drainage.

She was transferred to the surgical service of Dr. J. V. Lanza on June 17, 1951. On this service she was treated for three days with nothing by mouth, Cantor tube, infusions and daily injections of penicillin and streptomycin. Blood proteins and urea nitrogen were normal. Further flat plates of the abdomen June 17, 1951 (Fig. 2) showed the same mass now in the upper abdomen and considerable small bowel distention. The same day ausculation

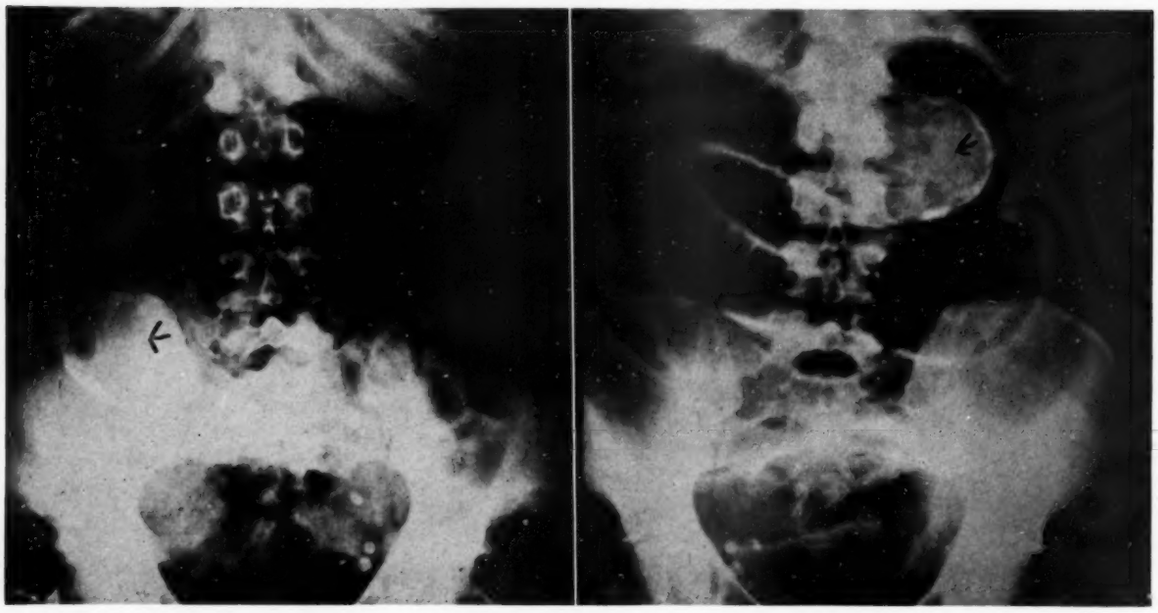

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FIG. 1. Scout film of the abdomen taken June 15, 1951. Round calcific density with calcified periphery is seen in the left lower abdomen; evidence of mechanical ileus not yet present.

FIG. 2. Film of abdomen on day of transfer (June 17, 1951) to surgical service now showing signs of mechanical ileus and the calcific mass now in the right upper abdomen.

of the abdomen showed high pitched bowel sounds with peristaltic rushes. Clinically, there was enormous distention. There was no deep tenderness nor rebound tenderness anywhere. The same mass (still not tender) was felt in the right upper quadrant. As the Cantor tube had been removed in error by the nurse on June 19th and bowel sounds or distention had not improved, it was decided to explore for the cause and relief of the small bowel obstruction, thought preoperatively to be due to adhesive bands. Proctoscopy to 5½ inches the day of the operation had showed no pathologic condition or masses.

At laparotomy on the evening of June 19th, the author found a yellowish-white, spherical, calcified wall abscesss 8 by 8 cm., containing old partially disintegrated gauze fibers and a creamy pus resembling liquid white lead without odor. It was enveloped in the greater omentum and densely adherent to the inferior surface of the collapsed mid-transverse colon. The small bowel obstruction extended from about 2 inches above the ileocecal valve. Proximal to this the small bowel was markedly dilated and beyond it completely collapsed. The immediate cause of the obstruction was seen to be an area of mesentery that had broken free from its adherence to the calcified mass, creating a hole in this mesentery, through which a major part of the small intestine had herniated. In addition the herniated loops had volvulated one complete turn without strangulation.

The procedure consisted of freeing all the loops adherent to the calcified mass, reducing the volvulus and internal hernia through the rent in the mesentery. In doing so the circulation of a short loop of small intestine was compromised and about 8 inches had to be resected. This was done by holding back the milked-back intestinal contents with rubber-shod intestinal clamps, and resecting the involved loop with its mesentery. End-to-end anastomosis was done by the open method suturing the crushed bowel edge with continuous lock suture of No. oo chromic catgut posteriorly and continuing anteriorly as a Connell suture. This was reinforced with interrupted sutures of No. oooo cotton for the seromuscular coat. The mass was freed from the transverse colon and excised. No communication with the lumen of the colon was seen. The raw area left on the inferior surface of the colon was covered by the remaining free portion of the greater omentum sutured in place with interrupted No. oo plain catgut.

Postoperatively she was treated with con-

tinuous Wangensteen suction and Cantor tube, intramuscular penicillin and streptomycin and intravenous aureomycin, blood transfusions, vitamin K injections and infusions. Unfortunately, the culture tube containing a swab of the pus in the abscess cavity was broken in transit to the laboratory and no report can be given. Convalescence was uneventful except for low-grade temperature for a few days and an easily controlled infection in the lower third of the wound. Closure had been done with figure-of-eight sutures of No. oo cotton for peritoneum, posterior and anterior rectus sheath and interrupted cotton for the skin. She was discharged about three weeks postoperatively. She is still seen in the eye outpatient clinic and has had no further abdominal complaints.

The pathologic report showed amorphous material with gauze fibers still distinguishable and a fibrous capsule for the mass with calcification in many areas.

Prevention of such occurrences today is made possible because (1) improved anesthesia lessens the hazard of diversion of attention due to troublesome resistance of the patient. (2) Raytec sponges and lap-pads with a black monofilament insert containing a barium sulfate concentration is one method of discovering such a cause as a retained sponge where disturbing postoperative symptoms occur. (3) The surgeon should take care that standard and approved methods are being used in the operating room for the handling and removal of sponges. Loose sponges should never be around when the peritoneum is opened. (4) Final inspection and palpation by the surgeon before closing the abdomen, in addition to the report of the sponge nurse, is the best defense.

SUMMARY

1. The x-ray and clinical findings of a case of retained sponge in the abdomen for thirty years have been presented.

2. An effort has been made to show why this possibility should be considered in the case of partial or complete obstruction when there has been a previous operation particularly a gallbladder or pelvic operation.

3. The commonly accepted means of its prevention have been emphasized.

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TUMORS OF THE TUNICA VAGINALIS TESTIS*

REPORT OF TWO UNUSUAL CASES

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TUMORS of the tunica vaginalis testis are of such rare occurrence that they are hardly considered in the differential diagnosis of intrascrotal neoplasms. Actually, an accurate clinical diagnosis is difficult because of the intimate relationships of the testicle to its adnexal structures, and therefore these tumors are often diagnosed as testicular growths. About 90 per cent of intrascrotal tumors originate in the testicle and the remaining 10 per cent arise from the spermatic cord, epididymis and the tunics. We are reporting two cases of unusual intrascrotal tumors that were recently treated at the Jewish Hospital of Brooklyn. One was a fibromyxoma and the other a fibrosarcoma; both of these originated from the tunica vaginalis testis.

FIG. 1. Gross appearance of the tumor at the time of removal. The testicle and epididymis were not removed. The left portion represents the cut surface; the right shows the external surface.

CASE REPORTS

CASE I. R. N. (No. 365946), a fifty-one year old white man, was admitted on September 10, 1952, with a history of a painless swelling in the left scrotum for one year. This swelling gradually enlarged, causing a dragging sensation. Past history and review of systems were non-contributory. Physical examination revealed a well developed and well nourished white man, with negative findings except for the genitalia. There was a freely movable, firm, somewhat irregular mass in the left scrotum, beneath which a normal testicle was palpated. The right testicle was not unusual. Hemoglobin, white count, urine and chest x-ray were all within normal limits. Clinical diagnosis was extratesticular scrotal tumor.

At operation the tumor was exposed through a combined left inguinal and scrotal incision. The growth was edematous, well encapsulated and was seen arising from and covered by the scrotal elements. The testicle was completely free from the tumor and covered by a small hydrocele sac. The tumor was removed by sharp and blunt dissection. The testicle, epididymis and the cord were left *in situ*. The postoperative course was uneventful.

On pathologic examination (gross description) the specimen consisted of a globular mass measuring 14 by 14 by 3.5 cm. The external surface was tan-gray, smooth and glistening. (Fig. 1.) The tumor was moderately firm in consistency. The cut surface was pinkish gray, bulging and moist, and had a myxomatous texture. Histopathologically, the tumor consisted mostly of fibrous tissue loosely arranged. Some of the cells showed a fibrillary structure and in most places assumed a spindle shape. The matrix had a myxomatous appearance. (Fig. 2.) Histopathologic diagnosis was fibromyxoma of the tunica vaginalis testis.

CASE II. M. N. (No. 368555), a seventy-two year old white man, was admitted on December 10, 1952, with the chief complaint of a hard scrotal mass. Six years prior to admission the patient had fallen from a ladder, sustaining an injury to his genitalia. This incident was followed by a painful swelling of the right scrotum which lasted for two weeks. Three months later the patient noted the onset of a painless swelling, in the right scrotum, which slowly increased in size. He had previously re-

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FIG. 2. Microscopic appearance of the tumor; note the myxomatous stroma and the presence of fibroblasts.

fused surgical intervention. The patient also noted increasing frequency and difficulty in voiding for the last five years, with nocturia two or three times. No daytime frequency and no hematuria occurred. There was a weight loss of 35 pounds in five years, which was attributed to dieting because of hypertension. The patient was a known hypertensive for twenty years, with the systolic pressure varying from 200 to 250 mm. Hg, and with frequent anginal attacks for the last five years. He had a bleeding peptic ulcer in 1948, and was admitted to Kings County Hospital in shock and treated conservatively. In 1949, the patient had a lipoma of the chest excised under local anesthesia. Physical examination revealed a thin, well developed man with a regular pulse rate of 90 and a blood pressure of 210/110. The heart and lungs were normal. The liver was palpable 2 cm. beneath the costal arch. It was smooth and non-tender. There was a freely movable, hard and irregular mass in the right scrotum measuring 6 inches in its greatest diameter, beneath which was a soft mass thought to be a secondary hydrocele sac. There was also a right incomplete and indirect inguinal hernia. No lymphadenopathy was present. On rectal examination the prostate was found to be moderately enlarged and firm. Hemoglobin was 81 gm. per cent; white cell count, urinalysis and an A.Z. test all showed unremarkable findings. The blood sugar, urea, acid and alkaline phosphatase were likewise

FIG. 3. Gross picture of fibrosarcoma showing the uninvolved bisected testicle; note the cystic areas of degeneration in the tumor.

normal. An electrocardiogram showed a regular sinus rhythm, with a left ventricular strain. Chest x-ray and intravenous pyelograms were negative. X-ray of the scrotum revealed a soft tissue mass with small areas of calcification. Clinical diagnosis was teratoma of the right testicle.

A medical consultant found no contraindication for surgery. On December 15, 1952, the tumor was removed through a combined inguinal and scrotal incision. The indirect inguinal hernial sac was ligated high, and the spermatic cord ligated and severed at the internal ring. The veins of the pampiniform plexus were found to be markedly dilated. The mass was covered by a hydrocele sac, which was removed

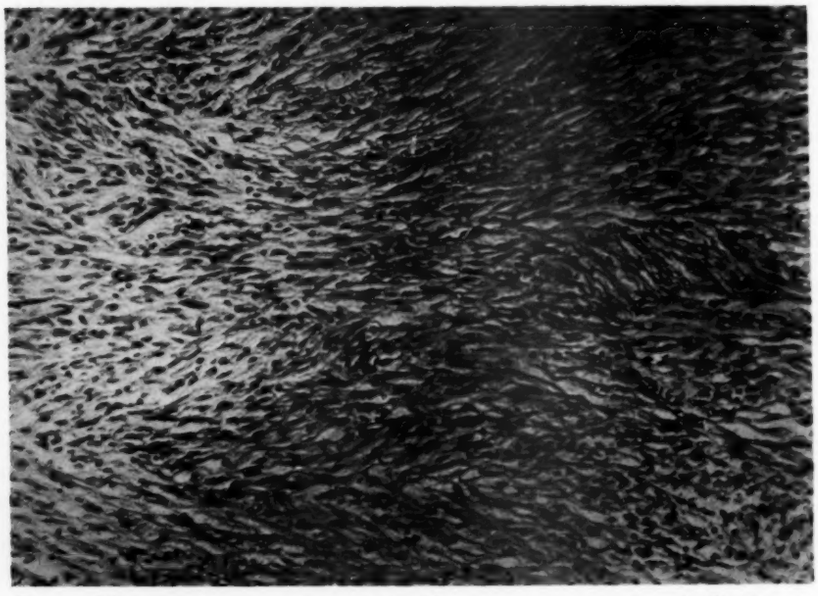

FIG. 4. Microscopic appearance of the fibrosarcoma; note the spindle-shaped cells and marked cellularity with lymphocytic infiltration.

intact. The patient tolerated the procedure well. However, that evening he had a marked diaphoresis, and the blood pressure was found to be elevated to 260/160. Magnesium sulfate was given intramuscularly. An hour later the patient complained of a severe headache and shortly thereafter went into a state of collapse and expired. The cause of death was attributed to cerebral hemorrhage. Permission for an autopsy was not obtained.

On pathologic examination (gross description) the tumor measured 13 by 9 by 5 cm. and weighed 570 gm. The external surface was gray-white, firm and nodular. The mass was covered by the tunica vaginalis, and in one area the tunic was markedly adherent to the tumor from which it could not be separated. The cut surface was tan-gray, fleshy and lobulated, with several areas of hemorrhagic necrosis. (Fig. 3.) The testicle and epididymis were found to be separate from the tumor and were not unusual. The spermatic cord could be traced coursing over the mass. Histopathologically, the preparation from different portions of the tumor revealed a variegated picture. In places most of the tumor cells were of the spindle shape variety and arranged in interlacing bands. In other areas the cells showed a bizarre shape with hyperchromatic nuclei in which a few mitotic figures were seen. Foci of round cell infiltration were noted intermixed with the tumor cells. (Fig. 4.) Around the periphery of the tumor bands of dense and hyalinizing fibrous tissue were seen. The sections from the testicle and epididymis were not remarkable. Histopathologic diagnosis was fibrosarcoma of the tunica vaginalis testis.

COMMENT

In reviewing the literature on tumors of the tunica vaginalis testis we found that most reported cases were of the benign variety, consisting mostly of the usual mesoblastic benign tumors. Fibromas constitute the most frequent type found. Examples of this type of growth were excellently reported by Thompson,[1] Kretchmer[2] and Goodwin.[3] The latter reported the occurrence of multiple fibrous tumors of the tunica vaginalis and distinguished between a fibroid reaction due to chronic inflammation and a true fibroma. He offered the suggestion that the term "chronic proliferating periorchitis" be reserved for cases of simple inflammatory thickening of the tunics, and that those arising separately from the testicle and originating from the tunica vaginalis should retain the acceptable term of fibroma.

Careful examination of the specimen cannot be overemphasized, as it is most difficult to distinguish tumors of the tunica vaginalis from those arising from the spermatic cord and epididymis. In discussing tumors of the tunica vaginalis testis it is likewise important to make a distinction between those cases arising from

the tunica vaginalis and those originating from the tunica albuginea. Benign tumors are common in both areas but malignant neoplasms arising in the tunica albuginea hardly ever occur. Fibrous tumors of the tunica albuginia have been reported by various authors, notably Hinman and Gibson.[4] An interesting tumor of neurogenic origin was reported by Levant and Chetlin.[5] A case similar to ours (Case 1) was reported by Rogers.[6] His case was a myxofibroma and was found bilaterally at autopsy on a patient who died of pneumonia. The tumor in one side weighed 6.5 pounds and measured 8.5 inches in its greatest diameter. With regard to malignant tumors of the tunica Rubaschow[7] collected some fifteen reported instances of sarcomas and stated that they are usually found in young individuals. Fibrosarcomas of the tunica vaginalis testis are usually slow-growing and metastases are a late manifestation of the disease. Since these tumors are of mesenchymal origin, we can see why such occurrence in the tunics is not rare. As far as the exact etiology and pathogenesis of these tumors is concerned, we cannot eliminate the role of irritation and trauma. Our second case had a definite history of both trauma and inflammation, and the question whether this had anything to do with the development of a tumor is still conjectural.

Most scrotal and testicular tumors are discovered early by the patients themselves, but there is a frequent delay in seeking medical advise. This is rather unfortunate as the scrotum lends itself to easy palpatory examination by the physician. It is well to follow up cases of this nature especially those with a history of trauma and inflammation, because only in this manner can we hope to save most of the patients. Early recognition and diagnosis is still a primary factor in reducing the mortality rate of cancer.

SUMMARY AND CONCLUSION

1. Two unusual cases of tumor arising from the tunica vaginalis testis are reported. One was a benign fibromyxoma and the other a malignant fibrosarcoma.

2. Tumors of the tunica vaginalis testis must be considered in the differential diagnosis of intrascrotal tumors.

3. Clinical differentiation of testicular tumors from extratesticular growths sometimes can be difficult.

4. Early diagnosis and treatment of these neoplasms is essential in saving most of the patients afflicted with these special tumors.

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PSEUDOEMBOLIC PHLEBITIS (PHLEGMASIA CERULEA DOLENS)*

A REPORT OF TWO CASES

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THE clinical entity "phlegmasia cerulea dolens" was first described in the French literature by Tremolières and Veran in 1929.[1] The terms "pseudoembolic phlebitis" and "blue phlebitis" have been used to describe the massive, venous occlusion that characterizes this condition.[2] Little attention was given this syndrome in the American literature until 1949 when DeBakey and Ochsner reported two additional cases.[3] Their review of the world literature revealed a total of only fifty-six case reports devoted to this condition up to that time.

The purpose of this article is to add two additional cases to the literature, and to report the successful use of anticoagulants in one of them.

CASE REPORTS

CASE 1. The patient, a twenty-six year old white woman, had a normal delivery one month prior to her admission to the University of California Hospital. The only notable complications of her full term pregnancy were ankle edema and albuminuria. On the first postpartum day the patient complained of mild pain in the calf of the right leg. The pain rapidly subsided, however, and the patient was able to leave the hospital on the seventh day following delivery. At that time there was no evidence of fever or swelling in the right leg. One day later the right leg again became tender, swollen and painful, and the patient was rehospitalized. Penicillin therapy was begun and continued for a period of two weeks. During this time the swelling and symptoms in the right leg diminished. One week after all symptoms had subsided in the right leg, the left leg became painful, swollen and cyanotic. This complication was treated with a lumbar sympathetic block of 1 per cent procaine, and some relief from pain was obtained.

At this time the patient was admitted to the University of California Hospital. The right leg was free from swelling but showed some residual tenderness on the inner aspect of the thigh. The left leg was markedly enlarged, exquisitely tender and exhibited a positive Homans' sign. The tenderness extended along the course of the saphenous vein to the level of the left groin.

Although anticoagulant therapy was begun immediately, the swelling and tenderness in the left leg increased. It was evident that a progressive thrombotic process was present throughout the venous network. In the hope of preventing massive necrosis from the formation of excessive edema, the leg was massaged actively. During this time the blood prothrombin level was maintained at a therapeutic level of 20 to 30 per cent. On the fourth day following admission to the hospital the leg became so painful that active massage was discontinued. During the next few days it was noted that demarcation of the tissues below the left calf was occurring. The progressive deterioration continued, and on the tenth day following hospitalization the left leg was amputated 6 inches below the knee. At the time of surgery all of the veins were thrombosed at the site of amputation. The arterial channels were completely patent at this level.

Study of the amputated specimen showed that the posterior tibial, dorsalis pedis and the long saphenous veins contained partially organized thrombi. The thrombi seemed to be relatively old, and there was an infiltration of numerous monocytic, inflammatory cells in the thrombi, the walls of the vessels, and the perivascular region. A marked eosinophilia ac-

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FIG. 1. Appearance of extremities three days after onset of symptoms. Note the line of discoloration extending on to thorax.

companied the monocytic infiltration. The dorsalis pedis artery showed an organizing thrombus associated with perivascular inflammation, but the remaining arteries were completely patent. The inflammatory response in the veins extended outward to surround the associated nerve trunks. The smaller veins to the muscles in the upper portion of the specimen showed a similar thrombosis, although some veins were patent in this area. The muscles in the upper portion of the amputated specimen were normal in appearance, whereas the tissue of the foot showed marked necrosis and obvious gangrenous changes.

CASE II. A twenty-nine year old Air Force cook entered the Hamilton Air Force Base Hospital for the first time on October 13, 1951, shortly after an automobile accident. There was a momentary loss of consciousness following the injury, but the patient was awake and alert upon his entrance to the hospital. At no time did he mention any leg or back pain.

Physical examination revealed an obese man with moderate ecchymosis beneath the left eye. The remainder of the physical and neurologic examination was not remarkable. Roentgen examination of the skull, and the routine laboratory studies were normal. He was discharged from the hospital after a two-day period of observation.

The patient re-entered the hospital two days after discharge complaining of acute pain which radiated from the left flank into the left groin. The pain had begun the day after he was discharged from the hospital and had increased to such severity that he was forced to remain in bed.

Physical examination of the left leg revealed a tense, diffuse swelling, more marked in the thigh than in the lower portion of the leg. There was a mottled, bluish discoloration extending up over the thigh, and the leg was cool to the touch. The left dorsalis pedis arterial pulsation was palpable, but diminished, as compared to the right side. The left thigh was 3 inches greater in circumference than the right thigh, and the left ankle was 1 inch larger than the right ankle. There were large, irregular areas of induration which were tender to palpation over the saphenofemoral junction. Homans' sign was positive, and tenderness was marked over the calf of the left leg.

Anticoagulant therapy of oral dicumarol and intravenous heparin was begun shortly after admission to the hospital. During the ensuing twelve hours the patient became more acutely ill, as was evidenced by the increased pulse rate and fever, hyperhidrosis and restlessness. The leg swelling and discoloration progressed, and the pain became more severe. (Fig. 1.) Although a left lumbar sympathetic block of 1 per cent procaine produced a noticeable increase in the warmth of the left leg, the pain was only partially relieved by this procedure. During the first evening of hospitalization the patient complained of right-sided pleuritic pain and coughed small amounts of blood-flecked sputum. There were crackling rales present over the right lung base. Laboratory studies revealed leukocytosis and a sedimentation rate of 50 mm. per hour. The urinalysis was normal.

After the first day of anticoagulant therapy the prothrombin level was within a 20 to 30 per cent range, where it was maintained for the

FIG. 2. The infra red photograph shows the marked venous collateral circulation which developed three months after occlusion.

ensuing two weeks. Within twenty-four hours the patient was noticeably improved. The restlessness and rapid pulse subsided and the back pain was almost completely relieved.

The remainder of the hospital course was one of steady improvement. Daily measurements indicated that the edema of the legs was diminishing. The bluish discoloration was replaced with numerous subcutaneous vascular channels over the left hip. Oral dicumarol was discontinued after eighteen days of therapy. Some edema of the legs was present at the time of the patient's discharge from the hospital one month after entry. The edema was partially controlled by long, elastic stockings. Follow-up examinations have shown the progressive development of large, collateral, venous channels over the abdomen, especially on the left side. (Fig. 2.)

COMMENTS

The name pseudoembolic thrombophlebitis is derived from the syndrome of rapidly progressive pain, swelling and cyanosis of the extremity. The profound circulatory changes simulate an acute arterial occlusion. Pathologic study of amputated legs and necropsy specimens, however, has revealed a patent arterial system associated with complete occlusion of the venous channels in the leg. In approximately 50 per cent of the reported cases the development of gangrene of the extremity necessitates amputation. About one-third of the cases have resulted in the death of the patient during the profound circulatory collapse in the first few hours after the onset of the process.

Many authors have emphasized the importance of arterial spasm as the primary factor leading to tissue ischemia. From pathologic studies it would seem likely that a rapid, extensive and complete obstruction of the vascular return from the leg is the more logical explanation for this embolic-like phenomenon. This process can be compared, in effect, to an experimental or clinical occlusion of the mesenteric venous return from the bowel. Blood finds entrance into the organ, or member, by patent arterial channels but has no avenue of escape. The results are stasis, edema, tissue ischemia and ultimate gangrenous changes, depending upon the amount of collateral circulatory return present.

Recently, a number of case reports have appeared regarding therapy for this condition.[4–6] Early evacuation of the clot and ligation of the femoral vein, or inferior vena cava, are recommended. It would seem that ligation should be avoided unless multiple, pulmonary infarcts are manifest, or unless anticoagulant therapy is contraindicated. The delicate balance between a viable extremity and progressive gangrene rests on the development of collateral venous circulation. Anticoagulant therapy prevents further thrombosis and aids in the development of collateral channels. Conversely, ligation of the affected major veins produces further occlusion and the incision unavoidably interferes with already established collateral circulation.

In Case II operative treatment would have been hazardous because of the patient's obesity together with the circulatory collapse which was present. Anticoagulant therapy produced a dramatic response within twenty-four hours.

Sympathetic block seems to have no place in the therapeusis of this disease, except as an adjunct in controlling pain.

SUMMARY

The cases are reported showing the typical clinical syndrome of so-called "pseudoembolic phlebitis." One of these patients was success-

fully treated with anticoagulant therapy. The pathologic entity and its treatment are briefly discussed.

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In the appendix carcinoid tumors are almost invariably benign. However, these growths may occur throughout the gastrointestinal tract and some 10 per cent of them acquire malignant characteristics and metastasize extensively, especially those arising in the rectum. In this location, however, they usually do not blacken ammoniacal silver nitrate, probably because the chemical enteramine is lacking. Tumors arising elsewhere in the gastrointestinal tract always take silver stains but after migration from the crypts in the intestinal wall to its surface, enteramine is no longer found in the migrated cells. (*Richard A. Leonardo, M.D.*)

PRESACRAL NEUROFIBROSARCOMA*

RICHARD J. CHODOFF, M.D. AND ALFRED S. CONSTON, M.D.
Philadelphia, Pennsylvania

WHILE presacral tumors are not particularly uncommon, neurofibrosarcomas apparently compose a very minor percentage of them, despite the fact that a large number of tumors in this area are of neurogenous origin. Adson, Moersch and Kernohan,[1] in a discussion of neurogenic tumors in the sacral area, note only three neurofibromas of thirty-three cases, nineteen of the cases being chordomas. Brindley,[2] in a general discussion of histogenesis and clinical manifestations of all tumors arising in this area, does not describe neurofibrosarcoma and states that the majority of these tumors are divided among dermoids, ependymomas and chordomas. However, in the discussion appended to the report, Gerster mentions a death from presacral neurogenic sarcoma. Whittaker and Pemberton[3] did not find one instance of neurofibrosarcoma in twenty-two cases of presacral lesions. They did note one case of fibrosarcoma, as did MacCarty et al.[4] in a series of ten tumors. From the pathologic viewpoint, the similarities between fibrosarcoma and neurofibrosarcoma may result in misinterpretation of the histology. In these instances the tendency is usually toward a diagnosis of fibrosarcoma.

All discussions of these tumors indicate that the clinical information is usually meager. Symptoms are varied, consisting predominantly of local pressure effects on the adjoining structures. Pain is especially prominent when bone invasion has occurred. In some instances, as in the case to be reported, symptoms are absent. The most reliable method of examination is the digital rectal examination.

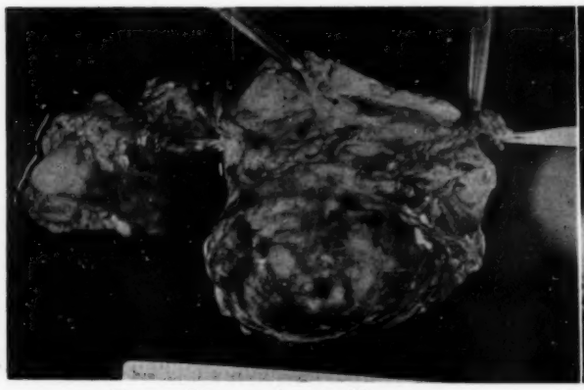

FIG. 1. Presacral neurofibrosarcoma.

FIG. 2. Presacral neurofibrosarcoma opened.

CASE REPORT

J. Y., a forty-three year old white male, was admitted to the Southern Division, AEMC. He had enjoyed good health, but presented himself to his physician for routine examination following the discovery of a carcinoma of the pancreas in his father. The physical examination was entirely negative except for the presence of a large ("grape-fruit" size) mass in the presacral area, felt on digital rectal examination. On June 7, 1951, two weeks after this discovery, he was admitted to the hospital. The following day, proctoscopic examination revealed a large retrorectal mass without apparent involvement of the rectal mucosa or wall. An x-ray examination of the pelvis was reported as negative. A preoperative diagnosis of presacral teratoma was made and operation was performed on June 11th. Through a right parasacral incision, carried down to the anal margin, the coccyx and lower portion of the sacrum were removed and the tumor delivered *in toto*, being easily dissected from the sacrum

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and rectum. The incision was closed with drainage. Healing occurred without incident and following an uneventful postoperative course, the patient was discharged on June 29th. Eighteen months after operation the patient was clinically well and showed no evidence of local recurrence or metastasis.

The pathologic report described a roughly globular mass measuring 10.0 by 10.0 by 8.5 cm. (Figs. 1 and 2). It appeared to be contained within a tough fibrous capsule measuring up to 0.6 cm. in thickness. The cut surface of the tumor had a variegated appearance, some areas being yellowish-white and friable, while others were cystic or hemorrhagic. Microscopic examination revealed the presence of spindle-shaped cells arranged in whorled bands, while some areas had a "herring-bone" or palisaded appearance. There were large areas of mucinous degeneration, cyst formation, hemorrhage and necrosis. There were no areas suggestive of teratoma. The pathologic diagnosis was neurofibrosarcoma.

COMMENTS

A case of primary presacral neurofibrosarcoma is presented. There is an apparent paucity of description of this tumor in an area where a large percentage of tumors have an origin from nerve tissue and nerve-supporting structures. Of a series of sixty-nine tumors of all types in this area, only one "neurogenous sarcoma" is mentioned, although an additional two cases are identified as fibrosarcoma, which is easily confused, pathologically, with neurofibrosarcoma. In addition, three cases were listed as benign neurofibroma. The majority of tumors occurring in the sacral area are dermoids or chordomas. Symptomatology of tumors in the area is varied, being primarily related to pressure effects or to pain resulting from bone erosion. Treatment is surgical, consisting of excision through the posterior approach, with adequate precautions as to preservation of rectal continuity and function.

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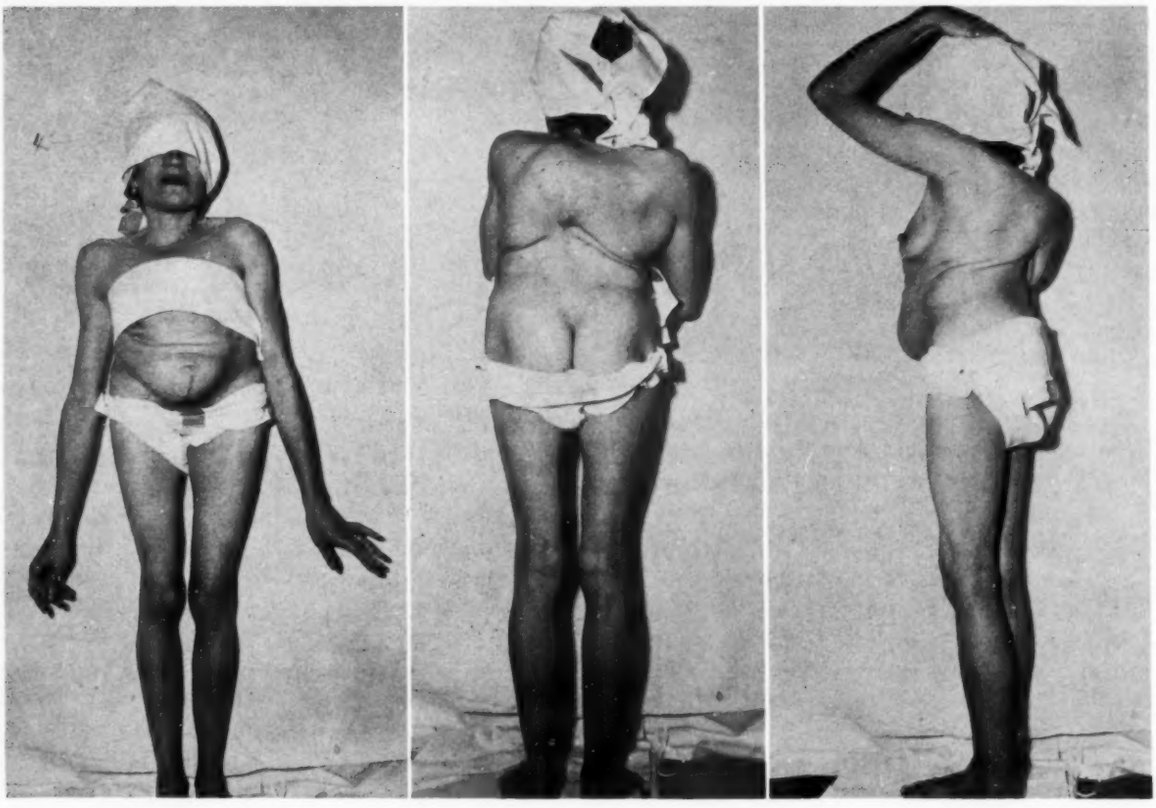
PREGNANCY AND KYPHOSCOLIOSIS*

LIEUT. PETER WELLS, M.C. AND LIEUT. HARRY S. MCGAUGHEY, M.C.
Portsmouth, Virginia

MARKED deformity of the thoracic cage as a complication of pregnancy is relatively rare. Mendelson[1] reported an incidence of 0.01 per cent for this complication at the New York Lying-In Hospital. A similar incidence was reported by Fearl[2] and Higginbotham[3] (1 in 12,000 and 1 in 18,790 deliveries, respectively). Since 1948, at the United States Naval Hospital in Portsmouth, Virginia, this complication has occurred once in 15,067 deliveries.

This case is added to the scant literature on the subject because of the additional complicating factor of preeclampsia superimposed on essential hypertension in an elderly primigravida and because improvement in the vital capacity occurred as pregnancy approached term.



1 2 3

FIGS. 1 to 3.

Mrs. E. W., an intelligent, forty-three year old, white primigravida, reported to this clinic in January, 1952, stating that she believed herself to be pregnant. Past history revealed that at the age of three she had been afflicted with Pott's disease of the spine and had been treated by bedrest, traction and braces until the age of fourteen. At the time of her marriage she was advised against pregnancy because of the residual deformity and for fourteen years practiced contraception successfully. In July of 1951 she was diagnosed as being menopausal

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and discontinued contraception. On September 15th she had her last normal menstrual period. In November the patient felt that she was pregnant, with the usual presumptive symptomatology. In December she was convinced and had protracted hyperemesis. A positive frog

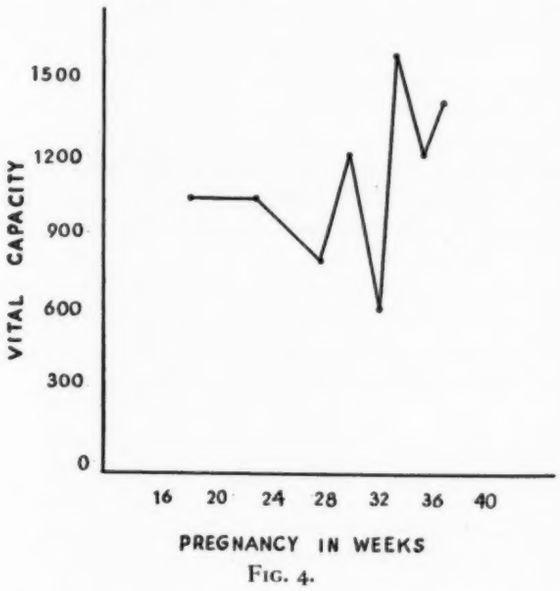

FIG. 4.

test was obtained and the patient was referred to this activity for possible therapeutic abortion. Additional history revealed that she had had an elevated systolic blood pressure (140 to 142) for years, the diastolic not being known, and that there had been a persistent tachycardia for at least six years for which quinidine had been prescribed. No history suggesting cardiac or renal failure was obtained.

Physical examination revealed an emotionally upset, dehydrated, frightened woman with the marked deformity of the thoracic cage. (Figs. 1 to 3.) Evaluation of the cardiorespiratory system revealed no gross impairment other than a blood pressure of 140/90 and a pulse rate of 90. The response to exercise was essentially normal. Mensuration revealed the patient to weigh 76 pounds, to stand 51 inches and to have a decreased trunk/lower extremity ratio. The right leg was 1½ inches shorter than the left and the pubic symphysis to zyphoid diameter measured 6 inches. There was a decided tilt to the pelvis, but clinically it was believed to be adequate for vaginal delivery (later confirmed by x-ray pelvimetry). The existence of a normal intrauterine gestation was confirmed.

FIG. 5.

The patient was referred to the medical service for consultation where photofluorographic and electrocardiographic studies, vital capacity, exercise tolerance, venous pressure, circulation time and kidney function studies were obtained. It was their conclusion that she was a class 1 cardiac and that interruption of the pregnancy was not mandatory.

A thorough explanation of the problem was presented to the patient and the decision to accept the risks involved in order to achieve motherhood was made.

The patient was rigidly followed by the medical and obstetric services, with weight restriction, salt poor diet, ample rest and mild sedation prescribed. The prenatal course was essentially uneventful except for a persistent tachycardia and blood pressure of 140/90 until the twenty-eighth week. At that time the blood pressure was 160/110. A trace of albuminuria and edema was present, and the vital capacity was 800 cc. The patient was immediately hospitalized. On complete bedrest, increased sedation and ammonium chloride the albuminuria and edema rapidly cleared; the

blood pressure stabilized at 140/90 to 160/100 and the pulse rate at 90 to 110; the vital capacity increased to 1,200 cc. Blood urea nitrogen, uric acid CO_2 combining power, phenolsulfonphthalein, Mosenthal, total protein with A/G ratio, red blood count, hemoglobin and hematocrit tests were all within limits considered normal for pregnancy. The urinary output consistently ranged over 1,000 cc. per day. The patient's condition remained essentially static except for mild fluctuations in blood pressure and pulse until the thirty-sixth week, at which time the blood pressure rose to 160/110 to 170/120, the patient gained three pounds in forty-eight hours and peripheral edema returned. It was decided to terminate the pregnancy.

As the cervix was not ripe, a classic cesarian section with bilateral tubal ligation was performed under local anesthesia supplemented by cyclopropane for closure. The infant, a girl, presented by the breech weighed 3 pounds 8 ounces and survived. The placenta was small and fibrotic.

The postpartum course was uneventful and the patient was discharged on the ninth postoperative day. Seven days later the blood pressure was 150/100 and the pulse rate 80. The patient was asymptomatic but stated that she had returned to the emergency room on her eleventh postoperative day where, because of cough and shortness of breath, she had been digitalized by the internist on duty. The patient was followed closely as an outpatient and within three months the blood pressure and pulse had returned to the prepregnant state. At six months laboratory evaluation revealed no residual cardiovascular renal impairment. (Figs. 4 and 5.)

In Figure 4 the vital capacities at the various periods are depicted. It is believed that the impairment in vital capacity was due to the upward displacement and splinting of the diaphragm by the pregnant uterus. However, in the latter weeks of pregnancy improvement in the vital capacity occurred. This was believed due to the shifting of the gravid uterus from an upright to a horizontal plane, which allowed increased diaphragmatic excursion.

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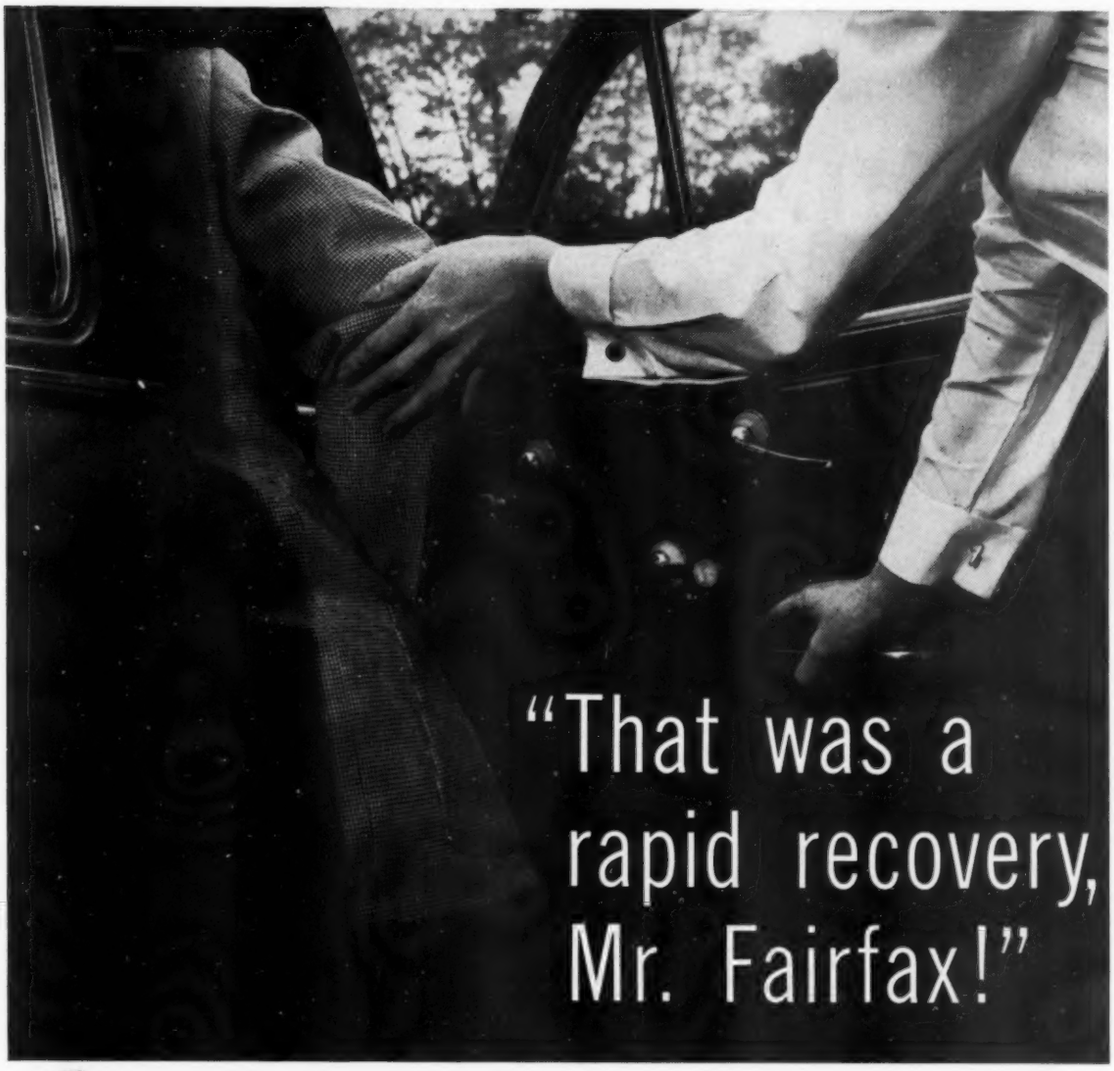

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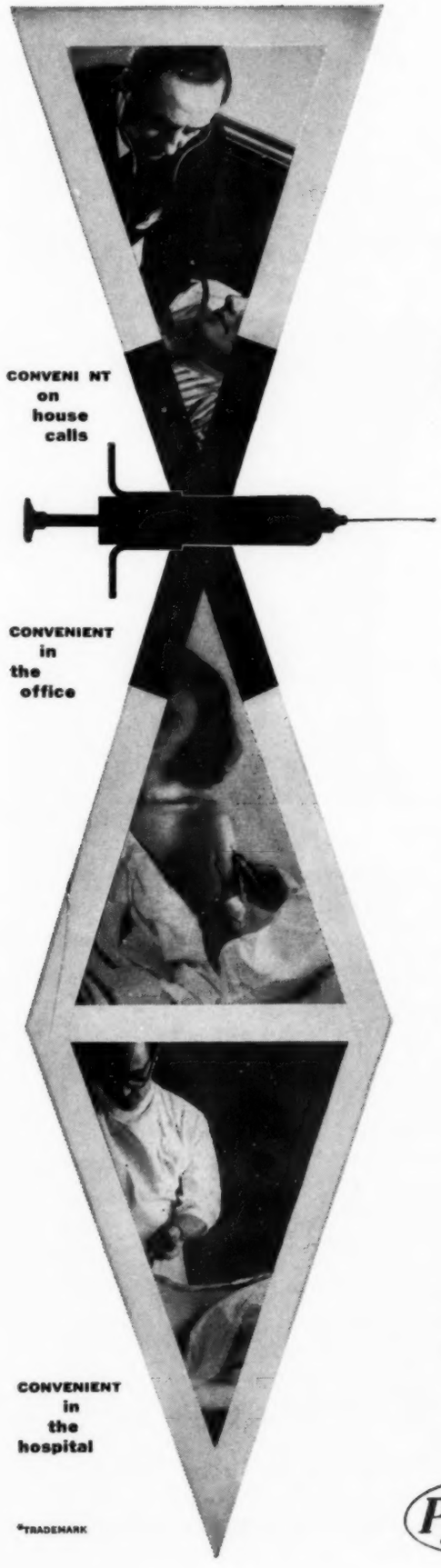

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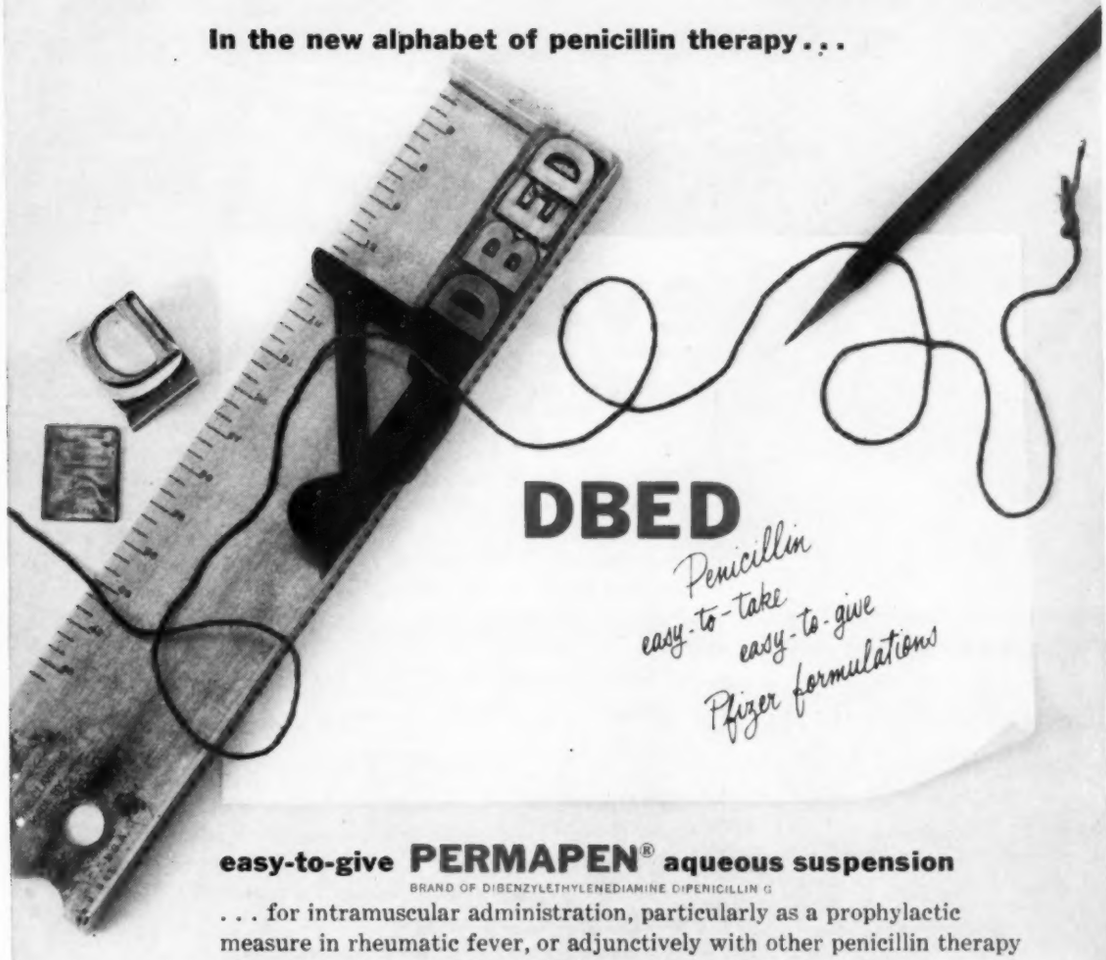

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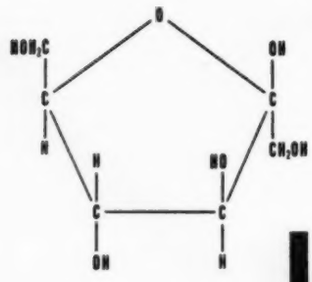

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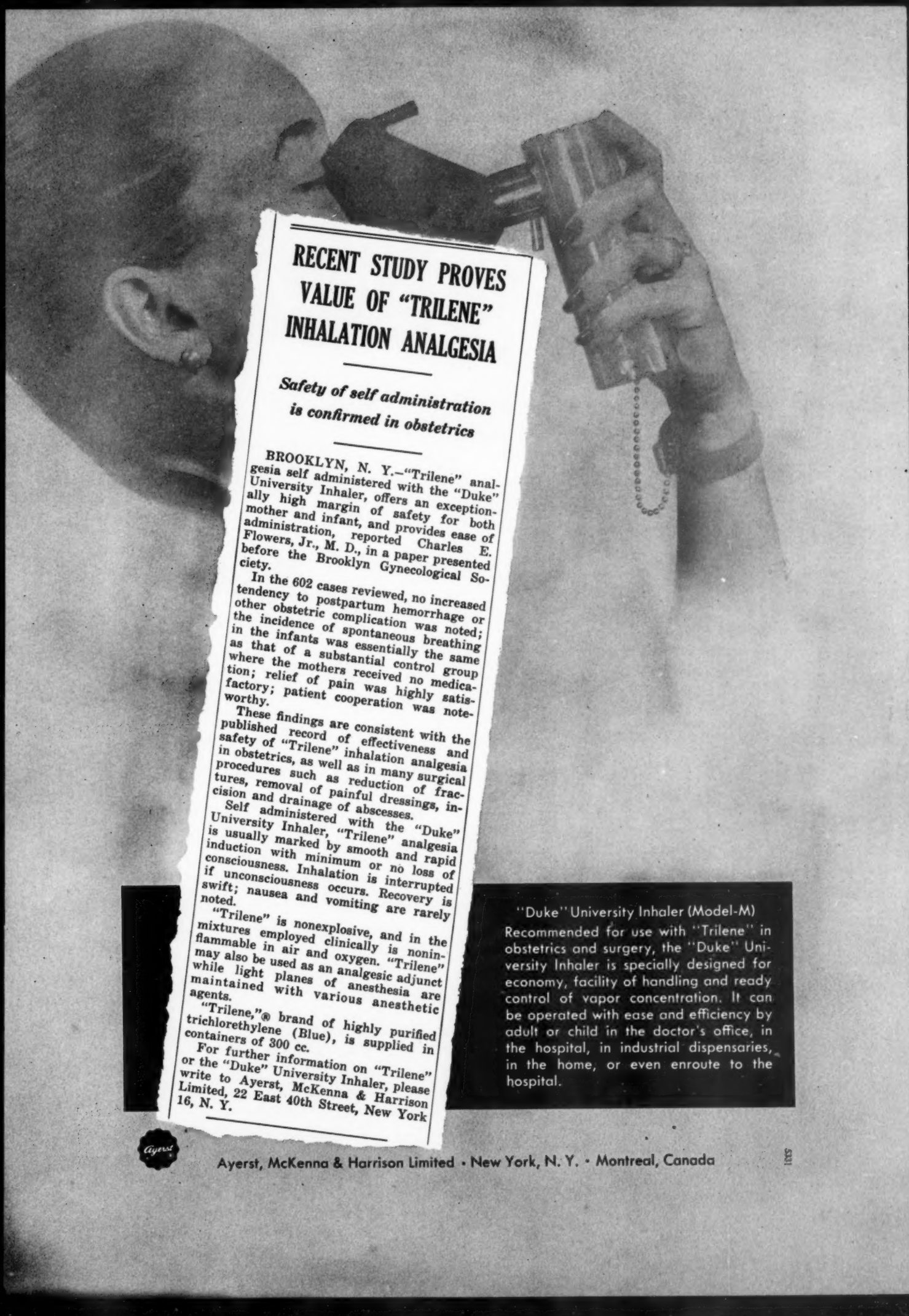

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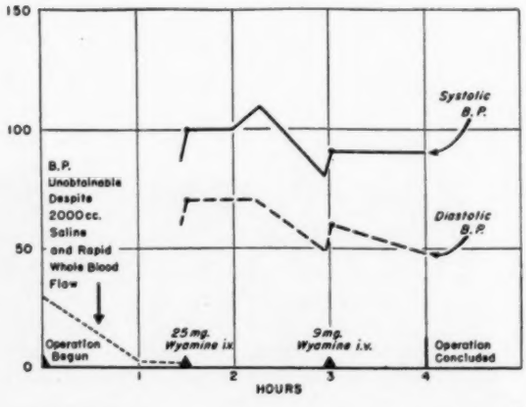

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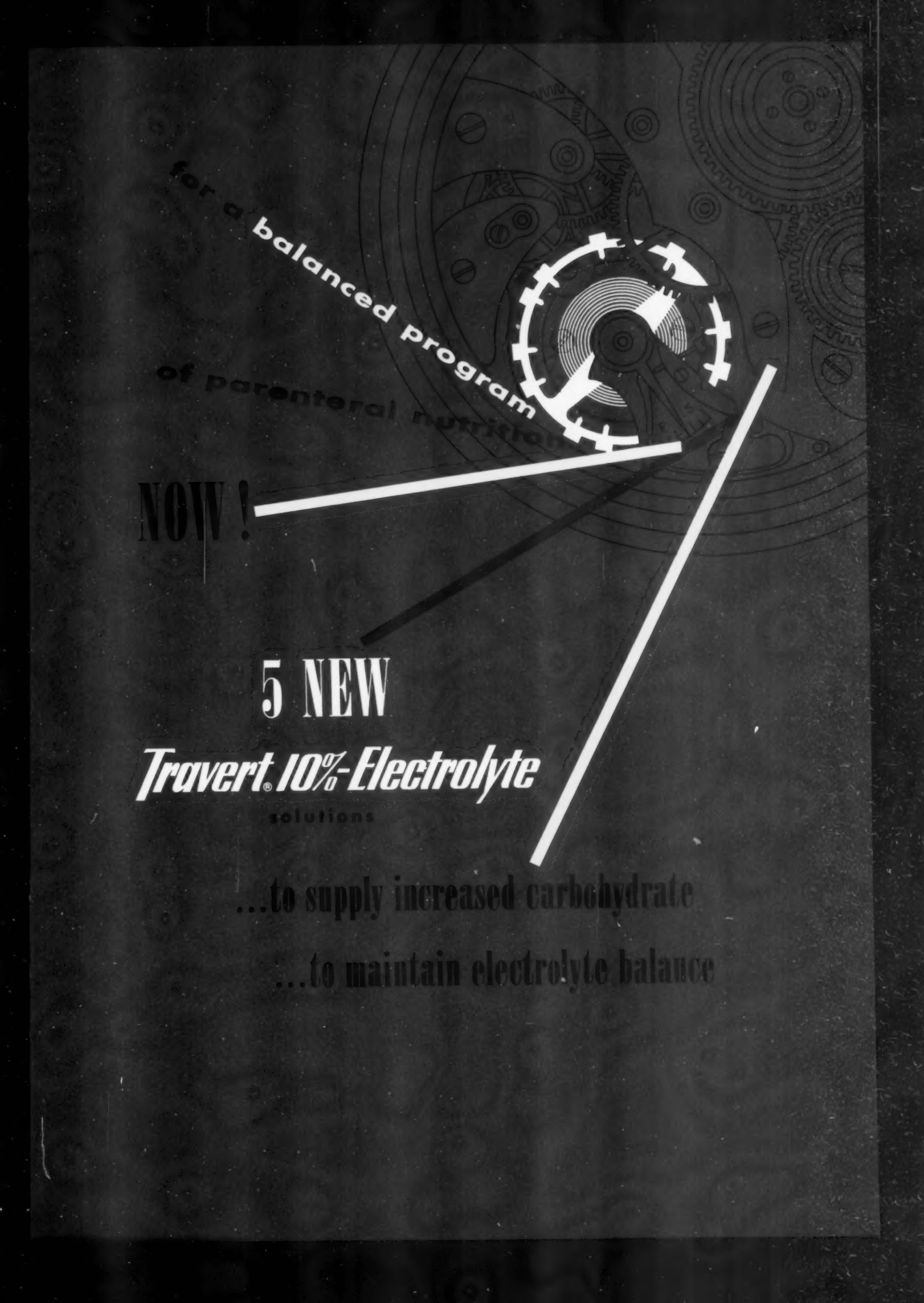
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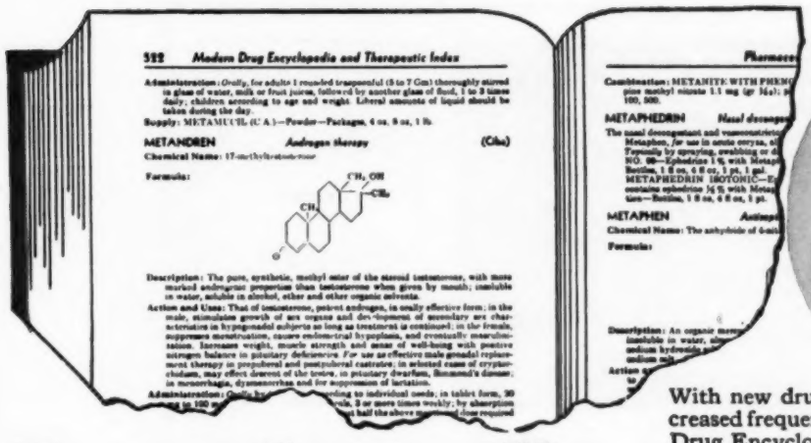

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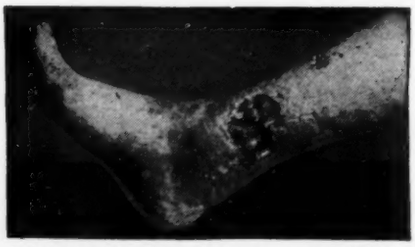

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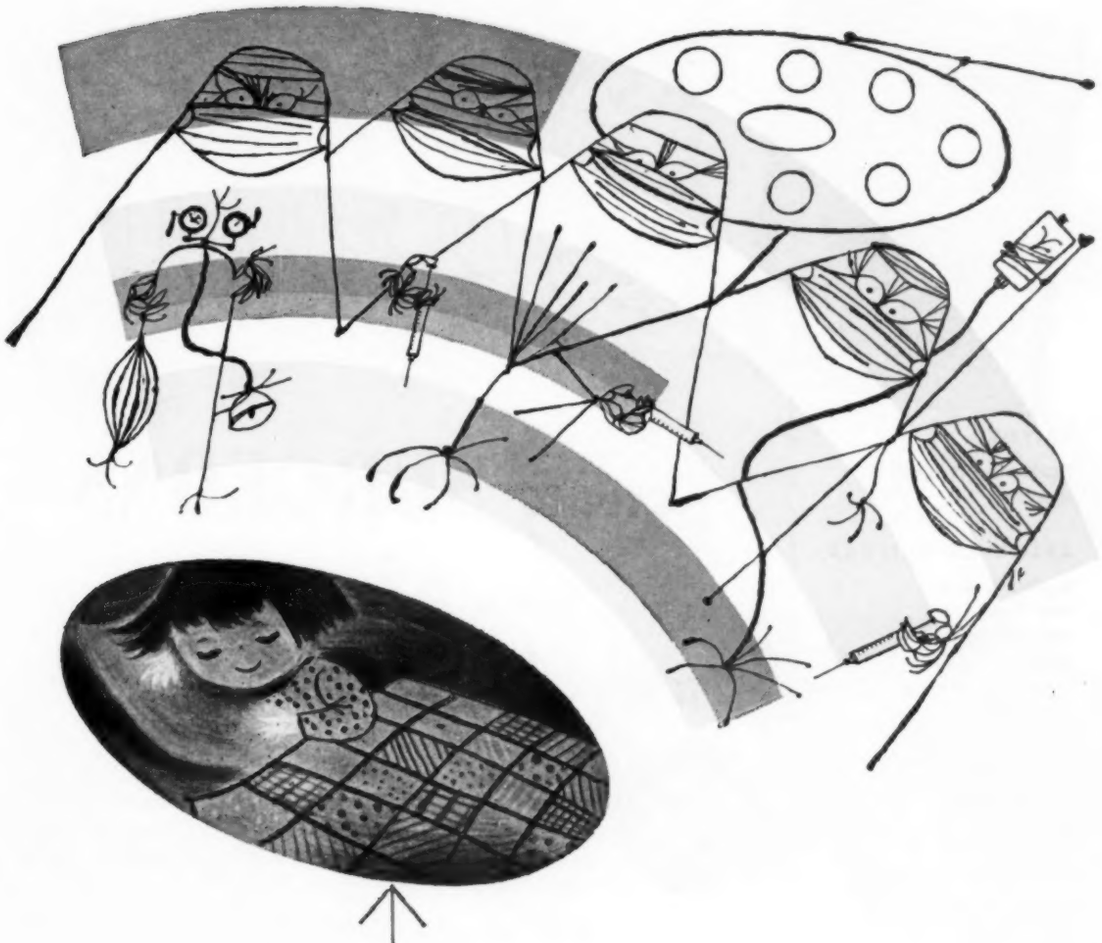

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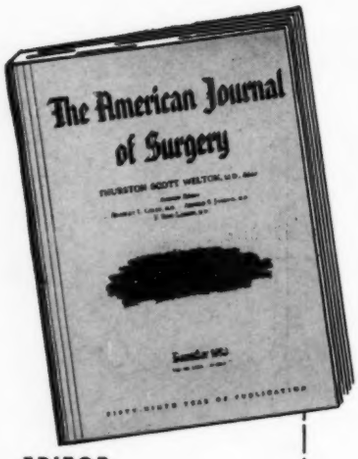

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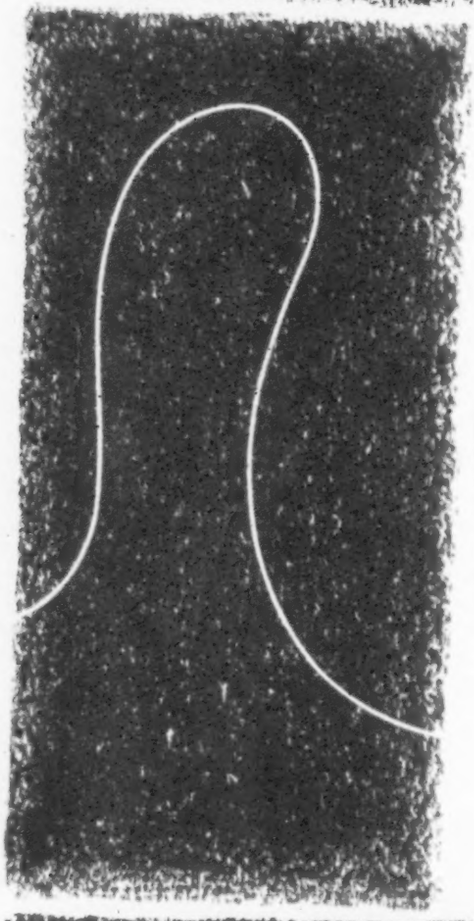

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1. Drabkin, D. L.: Metabolism of Hemin Chromoproteins, Physiol. Rev. *31*:345 (1951).
2. The Biosynthesis of Hemoglobin, Editorials, J.A.M.A. *150*:1223 (Nov. 22) 1952.

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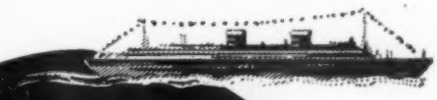

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1. Behrman, H. T., Combes, F. C., Bobroff, A. Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.
2. Turell, R.: New York St. J. M. 50:2282, 1950.
3. Heimer, C. B., Grayzel, H. G., and Kramer, B.: Archives Pediat. 68:382, 1951.

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REFERENCES

1. Sebrell, W. H., Jr.: Trends and Needs in Nutrition, J.A.M.A. *152*:42 (May 2) 1953.
2. Flour and Bread Enrichment, 1949-50: Prepared by The Committee on Cereals, Food and Nutrition Board, National Research Council, 1950.
3. Data furnished by the Laboratories of the American Institute of Baking, Chicago, Illinois.
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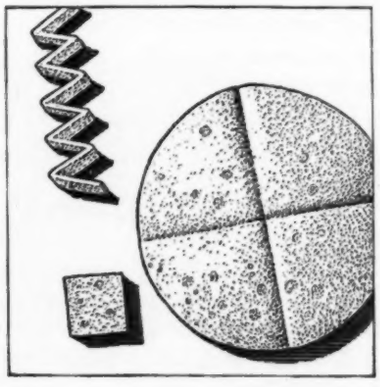

Outside the Ivory Tower

JUST back from a 38,000-mile, six-month survey of progress in tropical medicine, Dr. Eugene H. Payne, of Parke, Davis & Company, reported here that "malaria remains the biggest medical and economic problem in the world today." The famed clinical investigator, who has made twenty-four trips abroad and crossed the equator thirty-two times in the last twenty-three years on medical missions, said that malaria causes more sickness and death than any other disease. Every year, approximately 350 million people suffer from malaria, and at least three and a half million die. He explained that control measures reduce malaria but seldom eradicate it. "History shows," Dr. Payne pointed out, "that malaria is capable of breaking through all controls, with resulting epidemics." This, he went on, may be due to climatic change, or to the appearance of a new vector—an insect that carries micro-organisms from a sick person to somebody else. The new vector is immune to the control measures, because of different breeding and biting habits.

Dr. Payne visited thirty different research centers and conferred with several hundred scientists during his world-tour, the most extensive he has ever made. New malaria epidemics, he said, sometimes occur in areas where controls, such as insecticides, screening, oiling and D.D.T., had almost eliminated the disease. More deaths often result there than before the use of controls. Following years of protection from malaria, a person's partial immunity seems to drop below the safety point. He told of one remote area which had been noted for its malaria control. The disease appeared to be cleaned up. Yet, a few months ago, an epidemic of "almost unbelievable proportions" broke out. It will never be known how many died during that epidemic. In November and December, 1952, and January, 1953, there was unusual rainfall, with unusual winds. Humidity, which determines the life of insecticide spray, was high. The higher the humidity, the less time the spray remains effective. Thus in this instance unusual climatic conditions were responsible for the epidemic. He said suppressive drugs are still an integral part of any control program and are vital in halting an epidemic break-through.

Another tremendous medical and economic problem, Dr. Payne said, is amebiasis, commonly known as amebic dysentery. There is still no satisfactory answer to this problem. Amebiasis is spreading into new areas, despite all improvements made in sanitation. A new drug, he declared, is needed to clean up "carriers" and should have these four characteristics: It must be cheap enough for mass treatment; it must be fully effective; the treatment period should be short and the drug should be safe even in unskilled hands.

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(continued on page 56)

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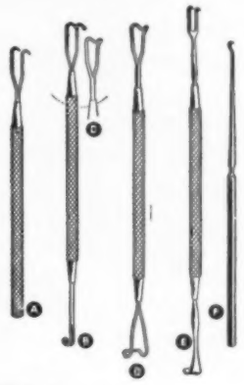

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Colostomy and Ileostomy Patients

find MORE convenience and LONGER service with

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Outside the Ivory Tower

(*continued from page 54*)

THERE is no margin for mistakes that cost human lives. Acting on this principle, a group of manufacturers, military men and industrial researchers have drawn up an American Standard for eliminating one unpredictable hazard of hospital operation. The standard is a safety code covering the use of medical gases. It prevents the accidental switching of gas containers on anesthetic machines and is infallible when human judgment is not. Thus physicians, dentists, hospitals and medical centers need not fear that carbon dioxide may be mistakenly administered for oxygen, or helium given instead of cyclopropane, with fatal results.

The new safety code, developed under the leadership of a committee of the Compressed Gas Association, is made up of some forty representatives of manufacturing companies, technical societies and the armed services. J. J. Crowe, assistant vice president of the Air Reduction Company, New York, is chairman. The committee developed the standard in cooperation with the American Hospital Association and the Association of Anesthesiologists. It was tested this spring in a number of large hospitals.

The safety code is called the Pin-Index Safety System. It forms an important addition to the fifty-six-page American Standard B57.1, Compressed Gas Cylinder Valve, Outlet and Inlet Connections, which has just been published in its newly revised form by the American Standards Association. In this system, two pins are placed on the yoke connections of medical gas cylinders, each pin being in a different position for each type of gas. Two holes are placed in a corresponding position in the valve connection of the gas cylinder. Since there is only one combination of pins and holes for each gas, it is impossible to use the wrong gas. If the wrong cylinder valve is tried, the holes and pins will not match and the two parts will not fit together. A similar system further insures the patient's safety by making certain that the cylinder corresponds with the type of gas with which it is being filled.

Hospitals are rapidly adopting the new system because they can easily convert their existing anesthetic equipment without waiting for replacement with new, up-to-date equipment. A yoke adapter fitted with the appropriate pins slips onto the yoke of the gas machine.

The new standard will be used internationally. It has been approved by the Canadian Standards Association and has been accepted by British industry and medical circles. In announcing approval of the new American Standard, Vice Admiral George F. Hussey, Jr, managing director of the American Standards Association, declared: "I believe that the men and the organizations who developed this project have made a vital contribution to the cause of humanity."

THE addition of surgical gut to their line of sutures has been announced by J. A. Deknatel & Son, Inc., of Queens Village, L. I., New York. To provide for this expansion, a new plant was erected and special equipment, representing the last word in technological know-how, was installed. For the past two years the Deknatel staff of expert suture technicians have conducted thousands of tests and experiments to make certain that their surgical gut would be up to the high standards of quality enjoyed by all products bearing the name "Deknatel." The Company reports a gratifying response on the part of surgeons and hospital executives to the introduction of their surgical gut.

In addition to the gut, a complete line of sterile silk in "readi-cut" lengths as well as non-traumatic needle combinations of gut and silk has been added to the Deknatel products.

THE biggest advertising campaign yet designed to encourage American doctors to join the United States Committee of the increasingly important World Medical Association is under way with the participation of the leading medical advertising agencies. The world group is devoted to the interests of freedom in medicine and to the exchange of new medical experience. It is also noted for extensive research projects and studies of the educational requirements everywhere.

Contributing to the campaign are: L. W. Frohlich and Company; William Douglas McAdams; Noyes and Sproul; Cortez Enloe; Paul Klempner and Robert Wilson. These agencies formed a committee to work with the World Medical Association. Layouts of the advertisements are being done at L. W. Frohlich. Copy is being prepared by Cortez Enloe. Medical journals are contributing space; for example, most of the state journals donated one page a month for eight months.

(*continued on page 58*)

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

STRYKER Portable Suspension Traction Frame

For fractures of the femur in infants and children. Designed for Bryant traction and to simplify reduction. Fully adjustable for children up to seven years. Child can be taken home several weeks earlier.

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Close-Up of Eye Taken with New Exakta "VX" Camera.

New Model with Pre-Set Diaphragm Control

35-mm. EXAKTA "VX"

Single Lens Reflex Camera for Parallax-Free Surgical Photography

The Exakta, with both regular and telephoto lenses, is widely used in hospitals for operation room photography. Its unique through-the-lens viewing system assures absolutely correct "on the subject" photographs during every step of the operation. In addition, this world famous medical camera is regularly used for preliminary, developmental, and end result pictures of patients; for copying X-Rays; and for making color transparencies of injuries and lesions —a necessity for recording and lecturing.

With f2.8 Zeiss Tessar "T" Coated Lens with Pre-Set Diaphragm Control	$279.80
Penta-Prism Eye Level Reflex Viewfinder	50.00
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Microscope Adapter	29.50

Write Dept. 500 for free descriptive booklet "E" on camera and accessories and brochure on close-up technique with the Exakta.

EXAKTA CAMERA CO., 46 W. 29th St., N. Y. 1, N. Y.
Exclusive Sales and Service Organization in the U.S.A. for Ihagee Camera Works, Germany

BRAND NEW GOV'T SURPLUS
SURGICAL INSTRUMENTS
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AT 50% BELOW REGULAR COSTS
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The exclusive
EDER-McCLURE
EXAMINING TABLE FOR RECTAL AND ROUTINE EXAMINATIONS

Patented proctological position recommended by specialists provides comfort, yet patient cannot move during instrumentation. Priced lower, yet it is two tables in one. Converts in 30 seconds to a handsome examining table.

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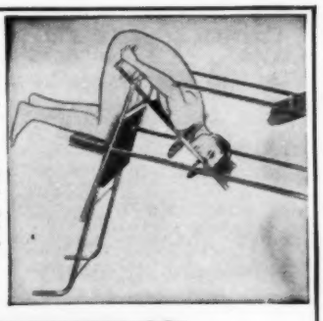

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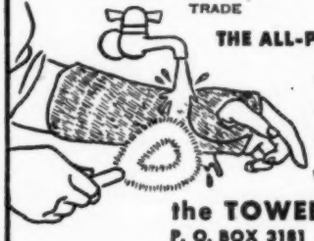

- It's light, strong, porous
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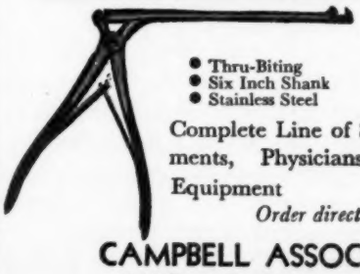

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Outside the Ivory Tower

(*continued from page 56*)

HEAT is what you usually think of in connection with sterilization in the battle against microbes. But did you ever hear of cold sterilization? Most people generally suppose, if they think about it at all, that sterilization of liquids can be accomplished only by adding a germicide to the liquid or by heating it to a point where bacteria will be boiled to death. But the Gas Appliance Manufacturers Association reports another method which has the advantage of not changing the taste or chemical composition of a fluid, and thus is playing a key role in blood processing and other modern medical wonders. It consists in putting the liquid through a microporous porcelain filter. Basically this is a china-like porcelain filter with pores so tiny that they block bacteria while allowing the liquid to drain through. These filters are the key to the processing of whole blood into life-giving plasma without damaging its cellular construction as well as important factors in the processing of wonder drugs, vitamins, insulin and in cancer research. The production of these highly specialized filters depends upon heat processing with gas since it is the only fuel that can provide the exact ranges of temperatures and the critically controlled atmospheres necessary to their manufacture. The filters go through several gas-fired kilns before they emerge in their final form. They get their name from the fact that the pores through which the liquids pass are measured in microns or fractions of microns. A micron is 1/254,000 of an inch.

NEW use of cortisone might prevent crippling in hard-to-repair tendon injuries, a team of Duke University researchers reported. Duke experiments may make it possible for a patient with a severed tendon to regain fuller use of his arm or leg, for example, than he can with some present methods of surgery. The Duke team reported to the American Orthopedic Association that cortisone used during and after tendon operations in research studies provides more flexibility and better muscle movement by preventing tendons from sticking to surrounding tissue during healing. Dr. Richard N. Wrenn and Dr. J. Leonard Goldner, orthopedic surgeons, and Dr. Joseph E. Markee, anatomist, said that cortisone also allows the muscle to become strong enough for normal use.

The Duke report is based on studies of three groups of dogs. In the first group the doctors performed twenty-two tendon operations on dogs receiving no cortisone. The second group included forty-seven operations on animals receiving cortisone, and tendon sewing was delayed several days to determine whether extra tissue would form after cortisone was stopped. Cortisone not only prevented extra growth, but also made tendon sewing much easier. Group three was made up of twenty tendons from the first two groups to test muscle strength. After periods from seven to forty-two days the cortisone-treated group were not as strong as the other, but each group healed well enough for normal use of muscles. The Duke team, aided by a grant from the National Foundation for Infantile Paralysis, have begun to use the new cortisone technic with patients.

THE Shampaine Company's "Stanton Specialists' Chair" has long been in universal use as a versatile and adaptable chair for general ear, nose and throat practice. Recent inquiries have led the company to re-emphasize the chair's origin. It was designed in accordance with suggestions made by Dr. A. W. Proetz, the author of the Proetz Displacement Technique, for the treatment of the sinuses. Dr. Proetz was interested in a chair in which the shape of the back would allow the patient's head to drop back fully yet comfortably, in order that sinus fluids might be replaced and held as long as the position was maintained. The Stanton Chair was accordingly designed with the back section shaped and contoured to meet the requirements of this particular type of treatment. With the back section lowered to horizontal level, the patient's feet rest comfortably and firmly on the floor. Arm rests add further to his sense of security.

For ophthalmologic purposes, use of the Tonometer is facilitated with the chair in the same position as described above, but with the headrest in place, as the specially designed headrest is self-adjusting to the patient's head and supports it securely and firmly. Acuity tests may be conducted from standard chair position and, when elevated to the proper height by the hydraulic mechanism, the Stanton Chair is ideal for ophthalmoscopic examination.

(*continued on page 60*)

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

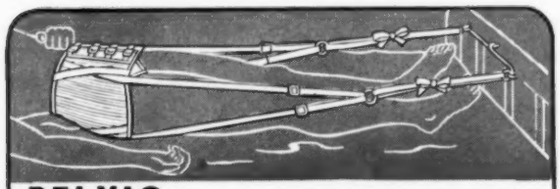
dura-sharp

VIM

stainless steel needles

will keep their keen cutting edge even after many sterilizations — the chrome-plated hub fits all U. S. standard syringes. Always specify **VIM.**

MacGregor Instrument Company Needham 92, Massachusetts



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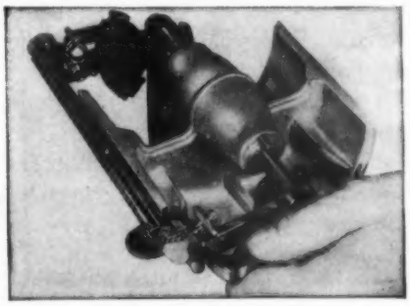

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For simplified split skin grafting with real accuracy and speed

- Inexpensive **THROW-AWAY** blades
- **DERMATOME TAPE** available for all models

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YOUNG'S DILATORS

Extremely useful in the treatment and prevention of contracted anus (particularly following hemorrhoidectomy), as an aid in perineal dissection and repair following delivery.

Sold only on prescription—at your surgical dealer or ethical pharmacy

Adult Set sizes 1, 1½, 2, 3—for stretching anal sphincter.
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Size 3 and 4 drilled to take towel clamps—for use in perineal repair.

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Disintegrating INTESTO-RING

(INTESTINAL ANASTOMOSIS RING)

Surgeon can SEE and FEEL the progress of the anastomosis. Facilitates and increases accuracy of intestinal anastomosis. Disintegrates and discharged in 40 hours postoperatively. Contains barium sulfate for x-ray purposes. Available at your Surgical Supply House. Write for Literature. 5 sizes —14mm, 18mm, 23mm, 28mm, and 31mm.

(All sizes are 25mm in length)

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Brand of CHLOROAZODIN U.S.P.

An Effective Anti-Bacterial Agent in

TRAUMATIC WOUNDS • DIABETIC GANGRENE
INFECTED ULCERS • DRAINING SINUSES

AZOCHLORAMID IN TRIACETIN 1:500

For moistening dressings and packings

AZOCHLORAMID SALINE MIXTURE

To prepare isotonic saline solution 1:3300 for irrigation, hot soaks, compresses, etc.

1935 ACCEPTED 1952

Non-toxic to tissue — Virtually non-irritating. Non-staining — Odorless — Strongly deodorizing PA-11

W&T *W&T Pharmaceutical Division*

WALLACE & TIERNAN PRODUCTS, INC., Belleville 9, N. J., U.S.A.

Outside the Ivory Tower

(*continued from page 58*)

IN a series of recognitions believed to be unprecedented in the hospital field, Foster G. McGaw, President of the American Hospital Supply Corporation, has presented certificates of appreciation to sixteen companies which have been American suppliers for twenty-five or more years. These certificates, presented in appreciation for twenty-five years of loyal and pleasant association, were awarded to supply firms which literally grew up with America while the American Hospital Supply Corporation was becoming the largest hospital supply and equipment organization in the United States.

In a covering letter addressed to the presidents of the sixteen firms so recognized, Mr. McGaw cited "the special worth of suppliers who, for more than a quarter-century, have repeatedly distinguished themselves by going an 'extra mile' to serve the best interests of American and its customers."

The awards' list includes supply firms whose names are well known in the hospital field and whose products are in daily use in hospitals throughout the country. Those companies which received this special recognition are: All-Steel Equipment, Inc.; Bard-Parker Company, Inc.; Becton, Dickinson and Company; Bauer & Black Division, Kendall Company; W. A. Baum Co., Inc.; Clay-Adams Company, Inc.; The Colson Corporation; Davis & Geck, Inc.; Davol Rubber Company; Hardwood Products Company; Johnson & Johnson; Kalamazoo Vegetable Parchment Company; D. F. Keller and Company; Oakville Company Division, Scoville Manufacturing Company; Taylor Instrument Companies and Wilmot Castle Company.

DIRECT contact with patient families, sometimes as early as the first year of medical school, is helping make better family doctors of today's medical students. In a special forty-five-page symposium in the July issue of *The Journal of Medical Education*, nine experts discussed the value of the family care program in the education of the physician. Dr. James M. Faulkner, dean of Boston University School of Medicine, is editor of the special section.

Dr. David P. Barr, professor of medicine at Cornell, outlines some of the objectives of a home care program in an introductory section. He says, "It deals with the life situation of patients outside of diseases as well as behavior and attitude to illness. It stresses the importance of convalescence, rehabilitation, the preservation of health and the prevention of subsequent illness."

A detailed outline is given of outstanding home care programs in operation at eleven medical schools, most of which utilize home visits as a method of acquainting students with the total medical problem. Other activities include interviews with members of the patient's family, conferences with social workers and visiting nurses and contacts with community agencies. This method of learning about comprehensive medical care helps students realize that the problems of many patients cannot be handled by any one person, but require the whole community team. Special topics considered by symposium members include: general practitioner supervision, prolonged illness, integration of psychiatry, observation of the family in the home, disease prevention and health service, comprehensive medical care, student partitipation and supervision.

THE National Foundation for Infantile Paralysis announced the approval of research and professional education projects totaling $2,283,384, which took effect July 1, 1953. The awards go to twenty-one medical schools, hospitals, research institutions and educational organizations in the United States. Of the total authorized, $762,380 was allocated for research seeking means of preventing the disease and for improved methods of treatment, and $1,521,004 for programs in professional education. This action brings to $50,000,000 the amount provided in March of Dimes funds since 1938 for the study of medical care problems, aid to professional education and the support of polio research. Since 1938 the organization has expended an additional $148,000,000 in meeting the costs of treatments for those patients who required assistance. Included in the professional education projects are four pilot studies "to integrate the concept and skills of complete medical rehabilitation" in the curricula of medical schools. The pilot studies are being conducted at The George Washington School of Medicine, University of Pennsylvania School of Medicine, New York University College of Medicine, and Cornell University Medical College.

(*continued on page 62*)

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

POTENT ANESTHESIA in Itching and Surface Pain

Via 20% Dissolved Benzocaine

A rapid control of surface pain in many post-surgical conditions: Hemorrhoidectomies, episiotomies, amputations, removal of tape. Also to prevent pain in rectal and other examinations and instrumentation. Available "Clear" and "With Chlorophyll."

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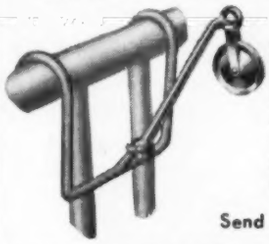
IMPROVED ADJUSTABLE EXTENSION HOOK No. 108



For Buck's method and Russell method of treating fractures of the femur. Fits over end of any bed. Vinyl plastic covered —no marring. No. 56-E has double pulley. Also weights, traction, cords, etc.

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*Containing for the First Time—SILICONES**

Adhesive—Moisture Repellent—Inert

To protect skin against maceration in colostomy drainage, ileostomy, cavernostomy, proctitis, diabetic gangrene, etc. Effective in many cases formerly failures under accepted therapy. Said to outmode zinc oxide ointment, aluminum pastes, calamine, etc.

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*As described in Jl. Inv. Derm., 17:125 (Sept. 1951)

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CONVENIENT WITCH HAZEL DRESSINGS

Tucks are ready to use discs of soft outing flannel, saturated with a solution containing witch hazel 50%, and glycerin 10%. Surgeons (and Nurses) like Tucks as a soothing sponge or dressing following anorectal and other operations. Your patients will like Tucks, too! A trial supply of Tucks will be sent to you on request.

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Doctors! . . . Specify

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Hastens patients' hospital discharge. Pleases and equips the patient completely without individual fittings or any "extras" to buy.

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More comfortable and efficient than adhesive strapping. Made of the finest quality elastic webbing.
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COMFORT *plus* SAFETY FOR ALL CONCERNED!

The *Jayne Bryant* Safety-Check Blanket provides safety, comfort and more freedom of movement for confused, agitated, excitable or violent patients, either hospitalized or in home confinement. *Write for complete information.*

Jayne Bryant **SAFETY-CHECK BLANKET**
Dept. J.S., 7646 Vincennes Ave., Chicago 20, Ill.

Outside the Ivory Tower

(*continued from page 60*)

A PLEA for greater selectivity in antibiotic therapy was made by Nelson of Temple University at a meeting of the New Orleans Graduate Medical Assembly held March 2–5, 1953.

In self-limiting diseases, severe infections not affected by available antibiotic agents, and non-infectious diseases simulating infectious ones, the speaker said, antibiotic therapy is unnecessary. Among the adverse effects of unnecessary treatment, Nelson held, are: possible carelessness in diagnosis, risk of untoward reactions of these agents, development of bacterial resistance and the establishment of a new resistant bacterial flora. The most widely active pathogens in the new-born seem to be gram-negative bacilli and Staphylococcus aureus, the speaker stated, and these should be combatted with broad antibiotic coverage. Patients with suspected osteomyelitis may be given aureomycin or terramycin alone. Penicillin alone was not advised. "Furthermore, treatment should be continued for at least two and one-half to three weeks in these cases. There is now an increased need for diagnostic acumen," Nelson said. "We are in an extremely dangerous position diagnostically—since the old familiar patterns do not appear when there has been early treatment."

FOR the first time since 1914, when a Clinical Congress was held in London, England, that city will be host to a Sectional Meeting of the American College of Surgeons on May 17 to 19, 1954. This meeting, held at the invitation of leading surgeons of England, many of them Honorary Fellows of the American College of Surgeons, is arousing wide interest, and it is anticipated that more than 500 surgeons from Canada and the United States will attend. All ethical members of the profession are invited to participate in a program which, from all indications, will add another distinguished chapter to College history.

To make this event even more auspicious as well as useful, the Association of Surgeons of Great Britain and Ireland will hold its meeting immediately preceding these dates, in Leeds, May 13 to 15, and the International Society of Surgery in Paris plans special sessions immediately after the London meeting. Other European cities, too, are planning special features for interested surgeons from other countries. Eminent professors of surgery from Great Britain, Canada and the United States will focus attention on problems encountered in day-to-day practice in general surgery and the surgical specialties. The comprehensive program will include sessions in the following specialties: neurologic, orthopedic, plastic, thoracic and vascular surgery, as well as gynecology and urology. An intensive program on cancer is being planned as well as sessions in ophthalmology and otolaryngology. Medical motion pictures will also be included in the impressive, three-day program. To make this event even more valuable to visitors from Canada and the United States, special programs will be held on shipboard en route to the meeting.

AMERICANS are marrying earlier in life, and as a result the proportion of married among young people is the highest on record. According to the most recent data available, nearly 17 per cent of all girls at ages fifteen to nineteen are married now or have been married as compared with only 12 per cent in 1940. At ages twenty to twenty-four the current ever-married proportion is 69 per cent as compared with 53 per cent in 1940. For males the trend to early marriages is equally marked. Currently almost half of the men at ages twenty to twenty-four are or have been married as compared with only 28 per cent in 1940. Even in the older age groups the married constitute a notably larger proportion of the population than was the case prior to World War II. This is associated with a marked increase in the marriage rate during and immediately after the war.

The war-time and post-war marriage boom also occurred in several of the nations of the British Commonwealth—England and Wales, Scotland, Australia, and New Zealand. Similarly, an appreciable increase in the proportion married at the younger ages occurred in Ireland, Sweden and Norway, where relatively late marriage has long been common. In France and Germany, where large numbers of young men were out of the country during the war, the experience ran counter to the general trend, and the proportion of married young women was lower after the war than before. In Germany the shortage of marriageable men was accentuated by heavy casualties.

The Surgeon's Mart

When you are in need of surgical instruments or medical supplies you will find the dealers and manufacturers listed below ready to serve you. For your guidance when purchasing supplies we submit this list.

The Primer Bandage (moist) and the Dalzoflex Bandage (elastic adhesive)—suggested in the Pressure Treatment of

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and other ailments of the extremities where pressure is indicated. ***It Costs no more to use the best!***

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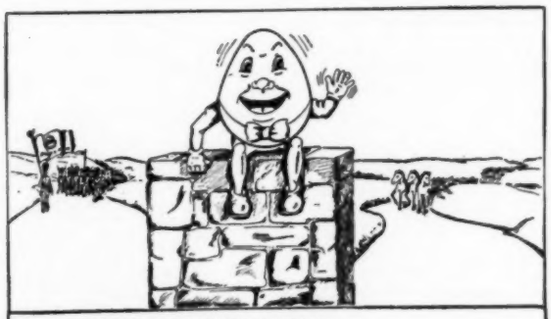

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BECAUSE—IN THAT DAY THEY DID NOT HAVE
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1. "Ultraviolet Blood Irradiation in Biliary Disease" (Am. J. Surg., Vol. LXXII, No. 2, Aug., 1946)
2. "Ultraviolet Blood Irradiation Therapy (Knott Technic) in Thrombophlebitis" (Am. J. Surg., Vol. LXXVII, No. 6, Dec., 1949)
3. "Use of Ultraviolet Blood Irradiation (Knott Technic) in Biliary Tract Surgery" (Am. J. Surg., Vol. LXXX, No. 1, July, 1950)
4. "Development of Ultraviolet Blood Irradiation" (Am. J. Surg., Vol. LXXVI, No. 2, Aug., 1948)
5. "Blood: Ultraviolet Irradiation (Knott Technic) (Med. Physics, Vol. 2, 1950, Otto Glasser)
6. "The Role of Ultraviolet Blood Irradiation in Surgery" (J. Int. Col. Surg., Vol. XII, No. 3, May–June, 1949)
7. "Ultraviolet Blood Irradiation Therapy (Knott Technic) in Non-Healing Wounds" (Am. J. Surg., Vol. LXV, No. 3, Sept., 1944)

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The American Journal of Surgery

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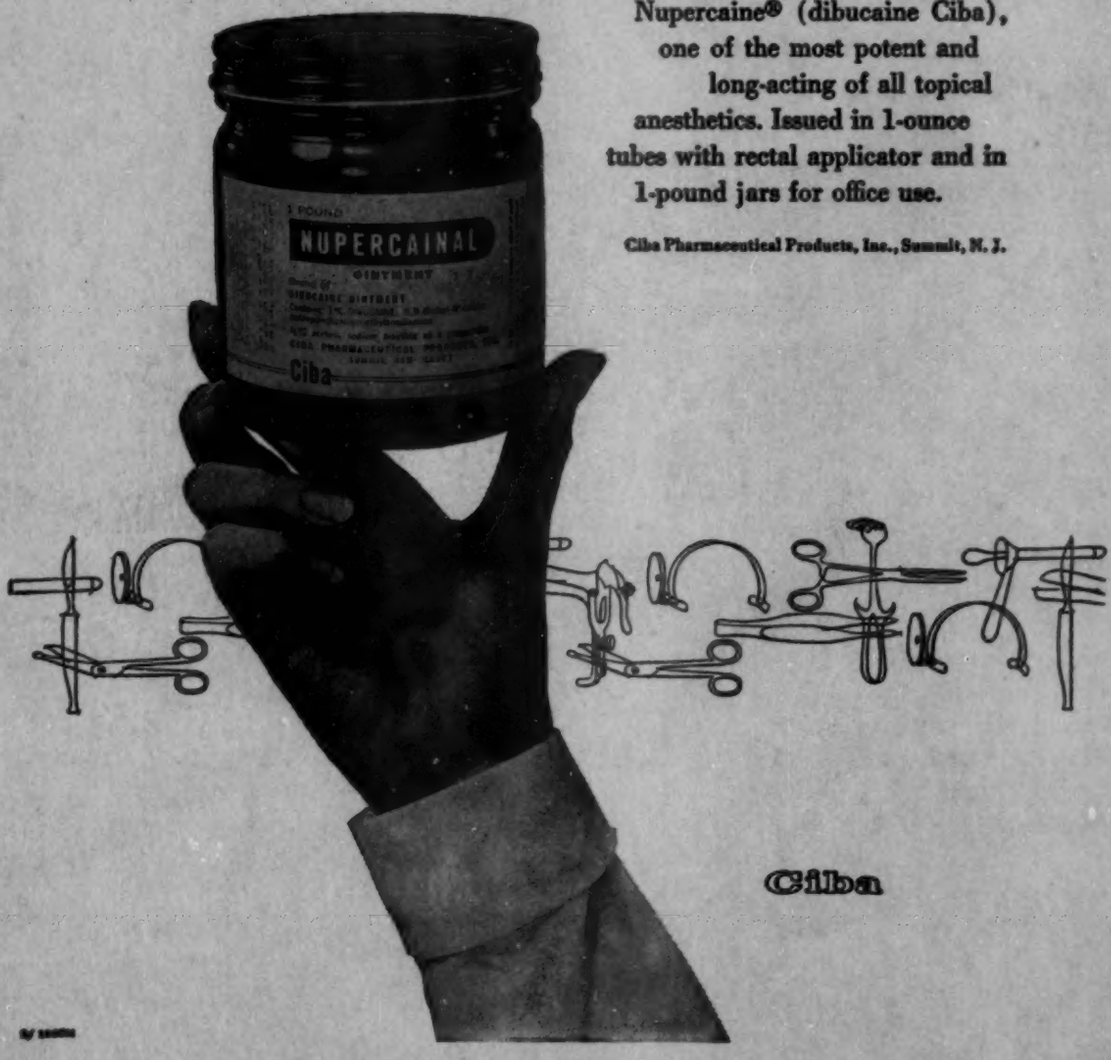

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